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## Peak performance

*How a ski resort heightens the slope-side experience with streamlined storage for innovative social apps. Plus: Groundbreaking storage solutions that are accelerating business gains around the world.*



➔ Storage landscape: Converging networks into an agile, elastic data center fabric

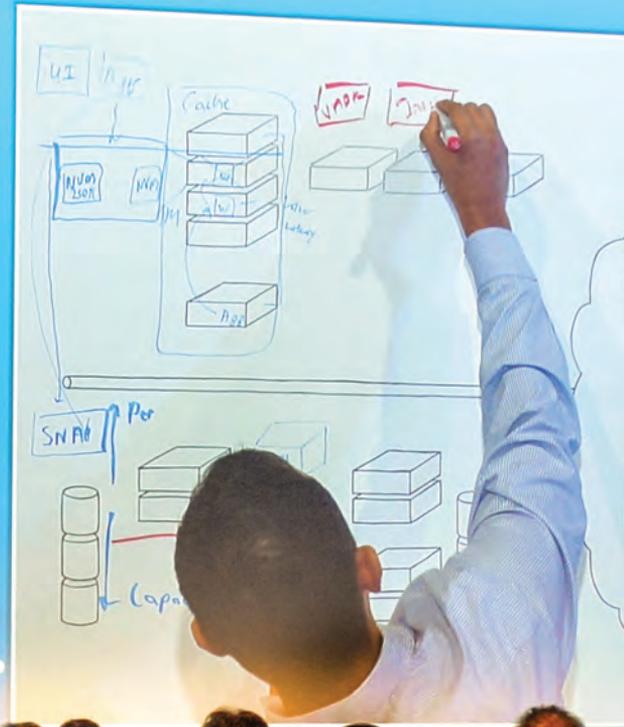
➔ Advanced networking: Exploring the Dell Virtual Network Architecture

➔ Intelligent data center: Running data centers cost-efficiently at elevated temperatures

➔ Focus on software: Extending always-connected capabilities with mobile device management



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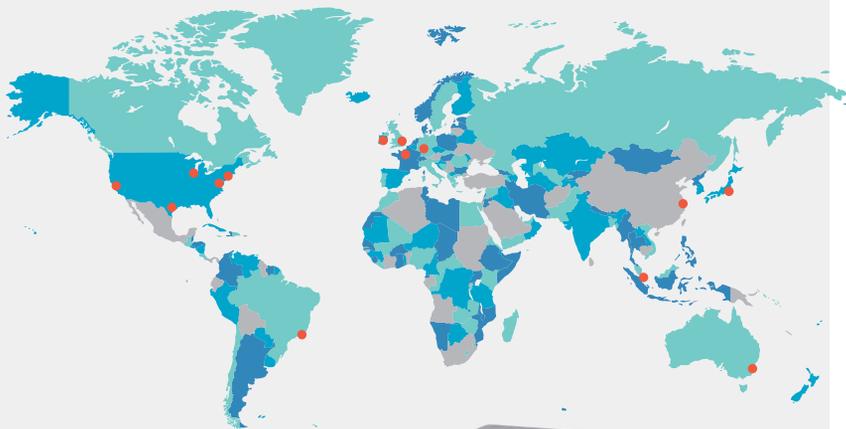
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†(1) Results based on testing by Dell Labs in February 2012 using Dell PowerEdge R720, R720xd, R710, R610 and PE2950. Actual performance may vary based on configuration, usage and manufacturing variability. (2) Results based on a time and motion study conducted by HP using HP Smart Update and HP Gen8 380 servers. \*\*50% more memory capacity is based on a comparison of the Dell M620 vs. the HP BL460c Gen8. \*\*Comparisons based on February 2012 Principled Technologies extrapolation of 10U worth of Rack servers (5 servers x 4 VMs per server = 20 VMs per 10U or 2.0VMs/U) vs. 10U worth of Blade servers (16 servers x 6 VMs per server = 96 VMs per 10U or 9.6VMs/U). \*\*\*Savings assumes \$0.07 per KW/hr and/or \$20 per KW/hr. Savings based on power usage calculated based on an average enterprise-sized data center. All Dell PowerEdge 12G rack and tower servers offer a "Fresh-Air" compliant configuration so the server can run beyond the industry standard of 35C/95F ([www.dell.com/freshair](http://www.dell.com/freshair)). ©2012 Dell Inc. All rights reserved. Intel, the Intel logo, Xeon, and Xeon Inside are trademarks or registered trademarks of Intel Corporation in the U.S. and/or other countries.



# Catching some fresh air



In the snow sports mecca of Vail, Colorado, fresh and cool air is a winter norm. As I write this column in mid-February, skiers gliding down the slopes in Vail are experiencing a temperature of 17 degrees Fahrenheit (°F), or -8 degrees Celsius (°C)—with the windchill index reading a nippy 3°F (-16°C). For resort chain operator Vail Resorts, Inc.—with properties in Vail, Beaver Creek, Breckenridge, and Keystone in Colorado, and in Heavenly, Northstar, and Kirkwood in the Lake Tahoe area—IT innovation is paying off. Visitors have warmed up to Vail Resorts' storage-intensive social networking app, EpicMix. Read more about its 200 TB Dell™ Compellent™ storage-based hosting environment for this cutting-edge, photo-centric app in our featured customer perspective, "Peak performance," beginning on page 24.

At the Dell headquarters campus in Round Rock, Texas, fresh yet somewhat warmer air is the norm. On precisely the same date and time in February—as another tour group was preparing to view a demonstration in the Fresh Air Hot House—the ambient air temperature was a balmy 80°F (27°C). Located just a few hundred feet from the *Dell Power Solutions* editorial offices, the Fresh Air Hot House is a living, breathing proof point for Fresh Air—compliant Dell servers, network switches, and storage. The building has no air conditioning, vents in the bottom of the building and a fan in the roof draw in fresh air to cool the equipment.

As part of the Fresh Air initiative, Dell systems over the last two generations have been developed to endure time-based excursions over a temperature range of 23°F (-5°C) to 113°F (45°C) and humidity levels from 5 percent to 90 percent. The Round Rock demo facility is particularly well sited to exercise the extreme upper end of that temperature range. For example, in 2012, the area experienced 70 consecutive days in which temperatures exceeded 100°F (38°C). For more insights from the team behind the Fresh Air initiative, read "Running data centers cost-efficiently at elevated temperatures," beginning on page 36.

Lastly, we enjoyed chatting with many *Dell Power Solutions* readers in our booth at Dell World 2012 last December. If you were unable to attend the second running of this annual event, you can read a wrap-up of the show at [qrs.ly/qa2zjg7](http://qrs.ly/qa2zjg7). We hope to see you at Dell World 2013.

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## Fortifying IT asset protection

Protecting endpoint data in the workplace is not a trivial matter for CIOs, IT decision makers, IT asset managers, or end users. The cost of replacing a physical device itself may be no more than a few thousand dollars. However, the value of sensitive enterprise information stored on a lost laptop, for example, can dramatically inflate its average replacement cost—possibly by many more thousands of dollars.

But cost is not the only challenge. The rapid rise in compliance requirements, widespread shifts to bring-your-own-device (BYOD) initiatives, and cloud-based delivery of applications and services add to the complexity of protecting endpoint data in a big way. In addition, mushrooming consumer protection laws run parallel with strict compliance requirements across a wide range of industries and businesses of all sizes. These challenges call for a comprehensive approach to endpoint security that is designed to simplify adherence

to compliance requirements and ensure appropriate protection for highly mobile data.

IT organizations are also looking for an easy-to-deploy data protection solution that provides holistic protection without impacting end users. They need data protection that can be easily integrated within existing endpoint security capabilities and does not interfere with existing management processes. To help meet these demands, Dell acquired Credant Technologies and its leading-edge data protection solution designed to safeguard individual files and protect enterprise IT assets. This approach helps provide security for data stored on PCs, mobile devices, and remote hardware.

The Dell Credant solution also addresses IT asset management requirements for comprehensive data protection without affecting how end users work or how devices are administered. For example, traditional full-disk encryption methods may derail device management applications, significantly swelling





the number of workloads for IT asset managers and impacting performance for end users. Instead, the Credant approach enables ongoing use of existing tools for managing and administering devices and providing comprehensive coverage of organizational data without derailing performance or requiring extra end-user effort. It is designed to deploy more quickly and effectively than full-disk encryption, and it provides preset templates that set standards to meet compliance statutes.

“Businesses need a data protection strategy that is comprehensive, flexible, and easy to deploy. The Credant assets will complement and extend current Dell device security features to help make Latitude, OptiPlex, and Dell Precision computers some of the world’s most secure.”

The Credant acquisition complements existing Dell capabilities in endpoint security including multifactor authentication, secure BIOS, and the certified Trusted Platform Module. Dell also offers the Federal Information Processing Standard (FIPS) Publication 140-2 Security Level 3 certification for extremely high-level data protection on PC platforms including Dell™ Latitude™ laptops, Dell OptiPlex™ desktops, and Dell Precision™ workstations. Planning is underway to integrate Dell enterprise security assets with Credant technology to

provide advanced Dell security solutions. Dell also plans to complement Credant offerings with existing Dell security assets including Dell SonicWALL™ software, Dell SecureWorks, and Quest™ software.

“In today’s work environment, data is always in-flight—from work being done on a local PC, sent via e-mail, stored on a USB drive, and saved in the cloud,” says Jeff Clarke, president, End User Computing Solutions at Dell. “Each one of those experiences represents a potential security risk. As a result, businesses need a data protection strategy that is comprehensive, flexible, and easy to deploy. The Credant assets will complement and extend current Dell device security features to help make Latitude, OptiPlex, and Dell Precision computers some of the world’s most secure. And when combined with the change in compute behaviors and data in-flight, Dell can now offer a differentiated security proposition based on its own intellectual property.”

### Turning nanoseconds into big gains

Dell has earned a reputation for listening to customers, working to understand their challenges, and using its knowledge and experience to provide technologies that address their needs. Dell Processor Acceleration Technology is a stellar example of how this focus helps drive innovation for Dell. After meeting with several high-frequency trading (HFT) firms worldwide, Dell engineering applied its deep knowledge of processor technology to an innovative solution that helps deliver higher frequency and more consistent and predictable levels of performance than ever before. It also includes a customizable implementation.

The essence of HFT is speed—speed of execution, speed of calculation, speed of access to markets. For a competitive advantage, HFT organizations rely on the sophistication of their algorithms and any edge they can gain from their

infrastructure. A slight performance improvement can create a significant competitive advantage in the HFT arena. It enables these organizations to evaluate offers quickly, get optimized pricing, and reduce slippage on trades to compete successfully in the market. Dell Processor Acceleration Technology is designed to offer HFT organizations the capability to tune processor performance to the specific needs of their proprietary algorithms. By enhancing performance, Dell helps HFT organizations enhance results from highly execution-dependent trading strategies.

Dell Processor Acceleration Technology enables flexible control of Intel® Turbo Boost Technology on specific Dell PowerEdge™ rack server configurations. It essentially locks in a high processor frequency by setting the number of active cores on the processor while utilizing all available cache—even the cache of the inactive cores. It also minimizes execution jitter caused by the usual transitions of standard turbo mode.

HFT organizations can now benefit from configuring consistent, high-performance settings that help provide enhanced performance and increased flexibility. Dell Processor Acceleration Technology is available on PowerEdge R620, PowerEdge R720, and PowerEdge R720xd servers equipped with Intel Xeon® E5-2690 processors and the Integrated Dell Remote Access Controller (iDRAC).

### Award-winning contributions to the workplace

Recent Dell end-user computing devices have received a warm reception across the industry. In particular, the following systems were given high marks from reviewers worldwide:

- **Dell XPS™ One 27:** *PC Magazine* granted an Editor’s Choice award for the high-end, all-in-one design in the XPS One 27. In addition to four and one-half out of

five stars for performance and ease of use, the *PC Magazine* reviewer remarked, "The Dell XPS One 27 manages to put almost every technology and feature we're looking for in a compact, stylish chassis."<sup>1</sup>

- **Dell Latitude 6430u Ultrabook:** *LAPTOP* magazine rated the Latitude 6430u four stars out of five and praised this Ultrabook for its durability: "The 14-inch Dell Latitude 6430u is built for the rough-and-tumble business world."<sup>2</sup>

In addition, the following PowerEdge servers and Dell Compellent™ Storage Center™ storage area network (SAN) arrays received rave reviews:

- **Dell PowerEdge M1000e blade system and PowerEdge C6220 server:** *InfoWorld* bestowed "2013 Technology of the Year" honors on these PowerEdge systems. Its reviews noted that the PowerEdge M1000e "is a remarkably complete and refined blade solution that incorporates many new ideas and innovations,"<sup>3</sup> and the PowerEdge C6220 is "a shining example of the new breed of high-density, no-frills server."<sup>4</sup>
- **Dell Compellent storage:** When *Information Week* editors polled readers on their favorite midrange storage arrays, Dell Compellent storage was deemed "the clear favorite."<sup>5</sup>

 [Learn more](#)

Dell Credant Technologies:  
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<sup>1</sup>Editor's Choice awards: Dell XPS One 27, by Joel Santo Domingo, *PC Magazine*, January 2013, [qrs.ly/l82za1q](http://qrs.ly/l82za1q).

<sup>2</sup>Dell Latitude 6430u review, by Sherri L. Smith, *LAPTOP* magazine, January 2013, [qrs.ly/7g2za1t](http://qrs.ly/7g2za1t).

<sup>3</sup>"InfoWorld's 2013 Technology of the Year award winners," *InfoWorld*, January 2013, [qrs.ly/mu2za1y](http://qrs.ly/mu2za1y).

<sup>5</sup>"Dell Compellent wins our storage evaluation," by Art Wittmann, *InformationWeek Global CIO*, May 2012, [qrs.ly/jy2za1z](http://qrs.ly/jy2za1z).

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## Converging networks into an agile, elastic data center fabric

By Tony Ansley, Achmad Chadran, Marc Keating, and Rich Martin

Virtualization and consolidation are driving the need to converge networks into a unified, highly efficient fabric for large-volume data flow. Dell offers exceptional network and storage innovations to optimize bandwidth for data center flexibility.

Data centers today must have the flexibility to support a rich mix of high-bandwidth network traffic, moving large volumes of data for applications as diverse as databases, imaging, voice telephony, and video. IT advances such as virtualization and big data analytics and the widespread proliferation of endpoints have added complexity to data center networks across industries and business models.

As a result, many organizations have come to rely on multiple, discrete networks that utilize interconnects to storage systems such as Fibre Channel, Internet SCSI (iSCSI), and InfiniBand to help meet performance level and quality of service (QoS) goals. At the same time, these network islands can be costly to implement, difficult to maintain, and inefficient to operate.

Emerging high-throughput fabrics such as 10 Gigabit Ethernet (10GbE) and 40 Gigabit Ethernet (40GbE) offer a tremendous opportunity for organizations to converge networking into a single, multipurpose infrastructure. Ethernet networks can now utilize standards-based advances such as Data Center Bridging (DCB) to help ensure QoS, reliability, and enhanced bandwidth allocation control. Emerging standards such as Virtual eXtensible LAN (VXLAN) and Network Virtualization using Generic Routing Encapsulation (NVGRE) enable virtualization of multiple network domains within a single broadband Ethernet network and seamless migration of workloads.

Because of the emerging nature of these capabilities, some organizations may consider waiting for these standards to mature before embarking on network convergence and data center fabric upgrade projects. However, delaying these enhancements may result in elevated costs and lost productivity because of the inherent

inefficiencies and limitations of maintaining their legacy networking infrastructure.

To help organizations take advantage of a converged network infrastructure while protecting their investments in existing data center networking, Dell offers a range of open, standards-based Ethernet fabric solutions designed to support efficient, flexible, and reliable network consolidation. Ethernet networking-supported protocols such as TCP/IP can provide efficient channels of communication for moving data among servers, storage, and the Internet. Dell™ server, network, and storage offerings leverage open standards, virtualization, and workload automation and intelligence to help simplify operations, enhance efficiency, and ensure interoperability with existing data center fabrics.

### Architecting specialized network and storage topologies

The Dell Fluid Data™ architecture provides a set of capabilities designed to automatically optimize data storage, improve storage efficiency, and enhance IT agility and business resiliency. Additionally, the Dell Virtual Network Architecture (VNA) offers intelligent management and automation for data center and branch and campus environments that enable dynamic control of virtual servers, desktops, and applications across 10GbE and 40GbE fabrics. VNA also virtualizes, automates, and orchestrates network services to enable organizations to be agile in changing business conditions.

Leveraging the Fluid Data architecture and VNA standards, Dell Force10™ data center networking switches and Dell Compellent™ Storage Center™ and Dell EqualLogic™ PS Series storage systems offer features such as storage and network virtualization, automatic configuration, and services orchestration. Compliance with

the DCB-standard extensions<sup>1</sup> also enables Dell data center fabric solutions to work better together in a range of topologies such as scale-out, scale-up, and data center-in-a-box architectures. Dell storage and networking can also be architected to support a range of specialized data center topologies that leverage advances such as converged 10GbE connectivity efficiently and cost-effectively.

### Empowering network convergence

The key enabler for any networking infrastructure is the switching technology that manages data center traffic. Dell Force10 data center networking switches enable converged, intelligent, and scalable switching capabilities for 10GbE and 40GbE fabrics.

Force10 switches comply with Dell VNA standards-based interoperability, adaptive workload intelligence, and efficient scalability,<sup>2</sup> and enable organizations to deploy a single physical network infrastructure that provides deterministic performance and QoS. Force10 switches are specifically designed to work seamlessly with Dell storage area network (SAN) arrays—Dell Compellent and Dell EqualLogic PS Series storage—and the underlying Dell Fluid Data architecture to help deliver automated, optimized performance.

Force10 switches are available as either discrete components or embedded into a converged, chassis-based architecture. They offer an efficient modular design with built-in Ethernet stacking capability for cost-effective scalability. In addition to the capability to stack these switches across chassis, their switching functionality also allows for enhancing efficient east-west traffic flow while optimizing north-south uplink capacity. Other features include flexible connectivity options through FlexIO modular switch technology that help deliver support for 40GbE quad small

<sup>1</sup> As of March 1, 2013, Dell PowerVault™ MD Series storage does not support the DCB standard.

<sup>2</sup> For more information on software-defined networking and VNA, see "Software-defined networking for the Virtual Era," by Arpit Joshipura, in *Dell Power Solutions*, 2013 Issue 1, [qrs.ly/4n2y82z](http://qrs.ly/4n2y82z).



## Evolving data center fabrics

Innovation is reshaping IT today, but upgrading data center fabrics can challenge IT organizations of all sizes. Download this solution brief to learn more about how Dell is advancing Ethernet fabrics and enterprise-class storage solutions to help organizations optimize data center efficiency.

[qrs.ly/2j2y84i](https://qrs.ly/2j2y84i)

form-factor pluggable + (QSFP+), 10GbE small form-factor pluggable + (SFP+), and 10GBASE-T ports.

These switches also support and integrate IP storage through a single 10GbE connection for enhanced efficiency. A performance-optimized design helps provide high performance and low latency for dynamic workloads and demanding east-west traffic flow. Additional features include access control lists (ACLs), internal traffic distribution and prioritization, high port density, and power and cooling optimization.

Powered by the Force10 OS (FTOS), Force10 10GbE switches leverage the DCB standard to help ensure QoS and reliability. DCB enables a lossless Ethernet fabric for converging multiple networks into a single common converged network infrastructure (see Figure 1). Force10 switches also include Virtual Link Trunking (VLT), an innovative Layer 2 multipath technology that enhances scalability and control in Layer 2 switching environments.

By leveraging key capabilities of the VNA such as software-defined networking (SDN), Force10 switches also include open, standards-based programmability that enables automation and virtualization; interoperability with both legacy

systems and greenfield network technologies; and hypervisor-agnostic support for virtualized server environments.

## Driving seamless, automated storage performance

Ensuring performance, responsiveness, and reliability of enterprise storage is an important consideration for organizations. As a result, many organizations rely on separate, dedicated networks to meet service requirements.

Dell Force10 data center networking switches are designed to deliver seamless, automated performance and QoS for the full range of Dell storage offerings. On-board intelligence enables Force10 switches to automatically detect and identify Dell storage systems on the network using the Link Layer Discovery Protocol (LLDP). The network is then configured automatically for the optimized data flow requirements of a particular storage system. For verification, Dell has tested and certified Force10 interoperability with Dell Compellent and Dell EqualLogic storage in a variety of data center application environments.<sup>3</sup> Force10 switches are optimized to meet the demands of a range of different network and storage

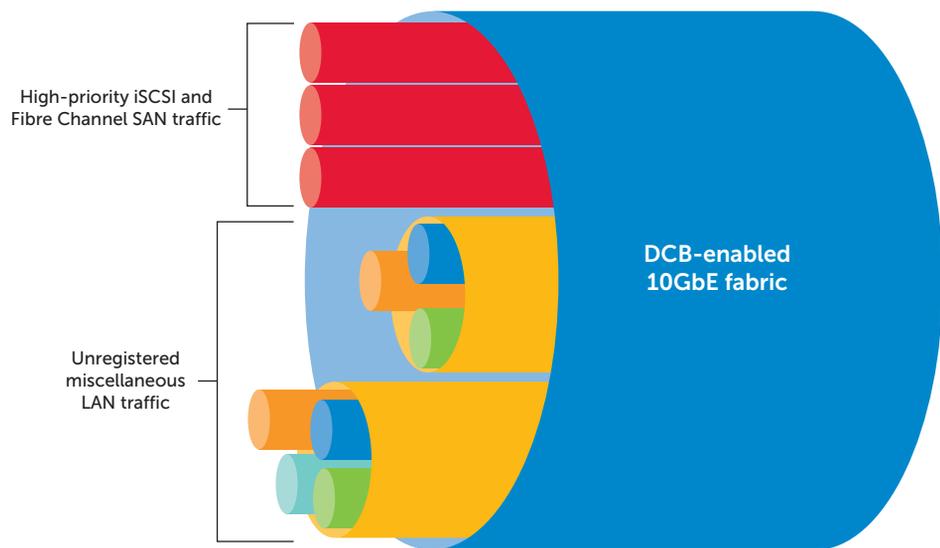
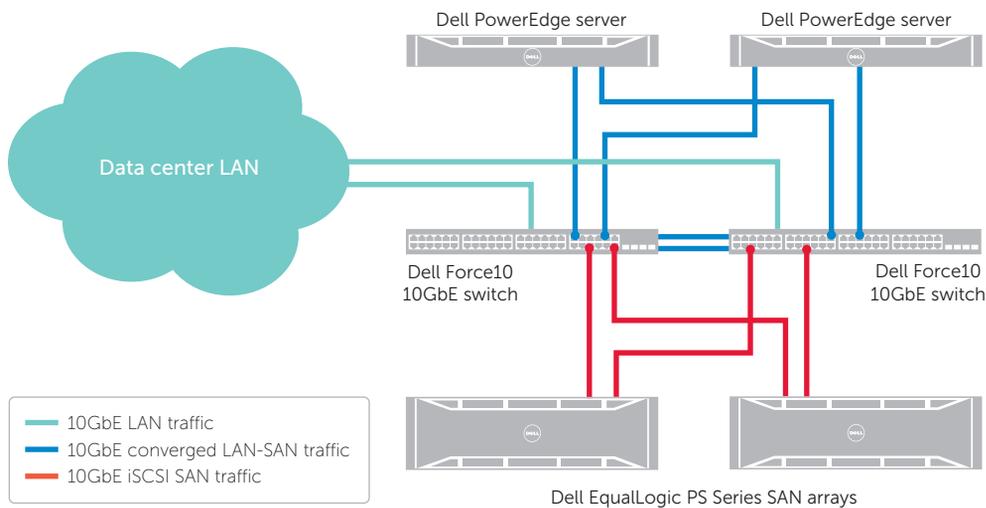


Figure 1. Converging iSCSI, FCoE, and other high-priority traffic on a single Ethernet network

<sup>3</sup> Based on testing performed at Dell Compellent labs for Dell Compellent Storage Center SAN arrays and at Dell EqualLogic Storage Infrastructure and Solutions (SIS) labs for Dell EqualLogic PS and FS Series storage.



**Figure 2.** Consolidating iSCSI SAN and LAN traffic over a converged 10GbE fabric in a scale-out architecture

topologies, including scale-out and scale-up architectures and converged, chassis-based, data center-in-a-box infrastructures.

### Scale-out architecture for storage data throughput

Organizations that depend on business agility often look for ways to maximize return on investment. One way to help accomplish this goal for their IT environments is to consolidate different types of network traffic onto a single 10GbE fabric without sacrificing performance and control. A scale-out architecture based on Dell EqualLogic storage arrays and Dell Force10 data center networking switches enables consolidation of both iSCSI and LAN traffic of storage data on a single 10GbE fabric (see Figure 2).

EqualLogic PS Series storage features a frameless peer storage architecture with multipath I/O technology that is designed to scale performance and capacity together to meet increasing demand. Scale-out File System capability can be added seamlessly with Dell EqualLogic FS Series network attached storage (NAS) appliances without changing the management interface. EqualLogic PS Series iSCSI arrays also include features such as storage virtualization, automated data tiering, and dynamic load balancing to enhance data center efficiency and scalability.

Force10 switches for data center networking leverage DCB-standard extensions to help ensure that an EqualLogic PS Series-based architecture delivers the intended performance over a converged 10GbE fabric. This converged network scale-out architecture not only helps organizations leverage cost, efficiency, and flexibility benefits of 10GbE, but also helps enhance storage efficiency and streamline management and operations.

### Scale-up architecture to maximize Fibre Channel networking

Organizations deploying and looking to maintain their existing investment in Fibre Channel-connected storage systems can scale vertically and consolidate network traffic onto a single, converged 10GbE fabric. A scale-up architecture based on Dell Compellent storage and Force10 data center networking switches, for example, is designed to deliver dedicated, scalable Fibre Channel over Ethernet (FCoE) capability in a converged 10GbE fabric without sacrificing performance or control (see Figure 3).

Compellent storage arrays offer innovative virtual port technology designed to deliver multiprotocol versatility that enables migration from any connectivity medium—Fibre Channel, iSCSI, or FCoE—to any other connectivity medium. A perpetual licensing model for

### Enabling multipurpose Ethernet

The Data Center Bridging (DCB) standard can serve as a vital tool for consolidating data center traffic onto a high-capacity Ethernet fabric. Download this Dell technical bulletin to learn more about DCB and how it excels at classifying and prioritizing traffic for converged Ethernet fabrics.

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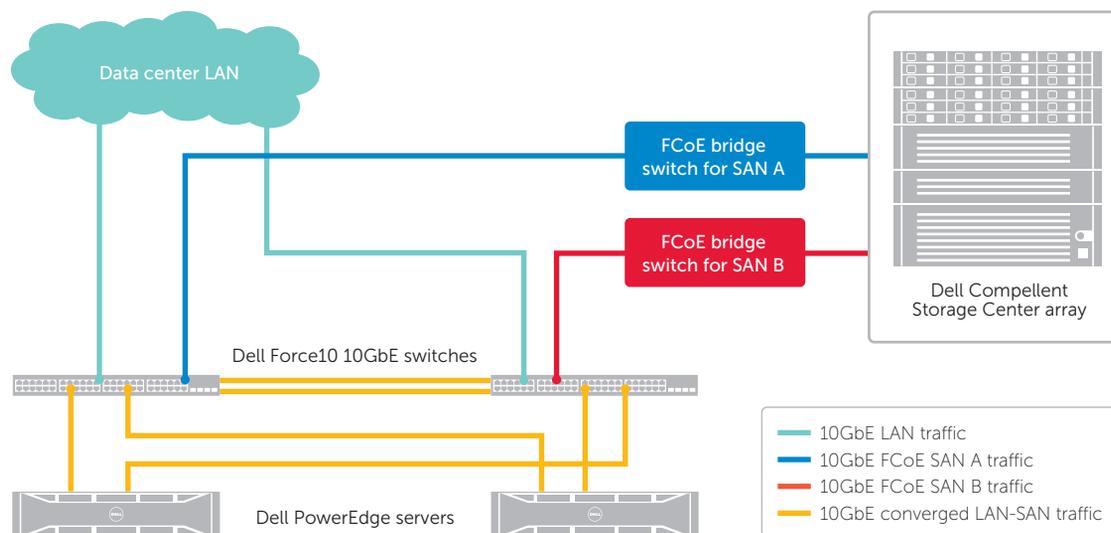


Figure 3. Maximizing Fibre Channel storage networking over converged 10GbE in a scale-up architecture

software enables organizations to scale up hardware without having to obtain new licenses for existing features. Additionally, Force10 transit rack-based FCoE and Fibre Channel infrastructure integration helps minimize costs and streamlines management through automated discovery of existing DCB network settings and propagation of those settings to downstream devices.

### Chassis-based converged data center in a box

Many organizations considering advanced application deployments such as private clouds and virtual desktop infrastructure (VDI) can adopt architectures that consolidate not only fabrics but also an entire infrastructure into a single chassis. The Dell Active System 800 converged infrastructure offers a preengineered virtualization platform that combines Dell PowerEdge™ blade servers, EqualLogic PS Series storage arrays, and Force10 data center networking into a single, integrated PowerEdge M1000e chassis.

Designed for virtualization environments, Active System 800 includes support for VMware vSphere® and Microsoft® Hyper-V®

virtualization platforms. Dell Active System Manager provides an intelligent, intuitive console that leverages template-based infrastructure onboarding and configuration. It also facilitates managing common administrative tasks. Force10 networking optimized for east-west traffic flow and leveraging the DCB standard helps deliver outstanding network performance and reliability within a single, converged 10GbE fabric.

### Emerging converged data center network fabrics

Optimizing data center fabrics is a key goal for many organizations with high volumes of data traffic that is often moved through a mix of networking islands that cater to different parts of the data center infrastructure. The emergence of broadband fabrics such as 10GbE offers a tremendous opportunity to help reduce complexity with robust, unified, high-throughput networking capabilities for dynamic, high-volume data traffic patterns that are a reality in today's data centers. Dell offers a range of topologies and converged networking fabrics for heightened data center traffic throughput that supports modular, scalable, and cost-effective server and storage infrastructures. **PS**

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# Optimize virtual infrastructure through integrated storage management

By Vikram Belapurkar, William Urban, and David Glynn

In highly virtualized environments, integrated management tools are critical for optimizing deployments. Dell™ EqualLogic™ Virtual Storage Manager for VMware® environments helps simplify management, as well as enhance data protection and performance.

Virtualization has become a central strategy for data centers as the underlying technologies mature and organizations realize the profound benefits of a virtualized IT infrastructure. Virtualized computing environments help improve resource utilization, reduce complexity, and lower operational and capital costs. Also, organizations that migrate to a fully virtualized environment typically benefit from enhanced agility and high availability of mission-critical applications. To address their virtualization needs,

many organizations have deployed a VMware vSphere® virtualized environment, which is designed to provide a robust, reliable platform from the desktop through the data center and out to the cloud.

Not surprisingly, a virtualized storage infrastructure complements a virtualized computing environment by enabling outstanding application performance, scalability, and simplified management. However, as organizations migrate more of their applications into virtualized environments, coordinating virtual resources with underlying compute and

storage resources can add substantial complexity. If not adequately addressed, the lack of comprehensive, integrated tools can complicate deployments and add to productivity loss and errors.

Comprehensive integration between storage and the hypervisor plays a key role in optimizing the value of virtualized deployments. And proper storage management tools that integrate well with the virtualization layer are essential.

A highly virtualized data center also requires data protection practices that are designed for the virtualized environment,



since tools and practices that were in place before virtualization are often inadequate and can further complicate data protection processes. Integrated tools optimized for virtualization help to efficiently streamline data protection.

In addition, consistent performance and service levels depend on how virtual machines behave on the underlying storage platform. The tight integration of storage and the virtualized environment enables the intelligent automation of tasks and policies required to maintain performance and service levels.

### Simplifying the management of virtualized storage

For efficient storage management in a VMware vSphere virtualized environment, organizations can deploy Dell EqualLogic PS Series virtualized Internet SCSI (iSCSI) storage area network (SAN) arrays. Included with EqualLogic PS Series arrays is the Dell EqualLogic Virtual Storage Manager (VSM), a powerful tool that enables administrators to manage EqualLogic storage from within the VMware vCenter™ interface (see Figure 1). VSM is deployed as a virtual appliance through a quick and simple process. The software tool offers several features designed to simplify storage management, optimize data protection, improve storage visibility within vSphere, and optimize virtual desktop infrastructure (VDI) deployments.

To facilitate management of VMware vSphere Virtual Machine File System (VMFS) datastores on multiple EqualLogic PS Series arrays, VSM guides administrators through the process of provisioning, expanding, deleting, and monitoring the datastores. The VSM Smart Copy, Smart Replica, and Smart Clone functionality allows the creation of snapshots, replicas, and clones for dependable data protection. In addition, tight integration enables VSM to communicate key storage attributes to vSphere for heightened storage awareness. VSM also can assist with simple, space-efficient provisioning and management of virtual

desktops by avoiding the storage of duplicate data across desktop virtual machines.

### Managing datastores in large-scale deployments

Dell EqualLogic VSM offers an integrated wizard that helps administrators quickly provision storage in the virtualized environment. They can create, monitor, and expand VMFS datastores through the VMware vCenter interface. Administrators can use the wizard's intuitive drop-down menus and predefined access policies to easily set up environments by simply choosing the number of datastores, the size for each, and the naming convention—saving time and minimizing training needs.

In addition, through its multigroup management capabilities, VSM bolsters the ability of EqualLogic storage to support large and demanding environments. These capabilities allow data to be spread over several EqualLogic PS Series groups, helping enterprises manage large-scale deployments that span multiple groups.

### Achieving simple, reliable, and cost-efficient data protection

Dell EqualLogic VSM provides Smart Copy, Smart Replica, and Smart Clone features for VMware vSphere-aware data protection. Through the creation of a Smart Copy, VSM helps automate the coordination of vSphere-based snapshots and array-based snapshots taken by the EqualLogic PS Series SAN (see Figure 2).

A Smart Copy can consist of one or more virtual machines or VMFS datastores, which comprise one or more point-in-time, space-efficient snapshots stored on EqualLogic PS Series arrays. A Smart Replica is similar to a Smart Copy but differs in where the resulting data is located. A Smart Replica is stored on a different EqualLogic PS Series group, typically at a disaster recovery location. A Smart Clone is a full copy of the multiple virtual machines or datastores that are presented to the same vSphere environment. Smart Clones can be used to quickly create copies of virtual machines from templates for production or test use.

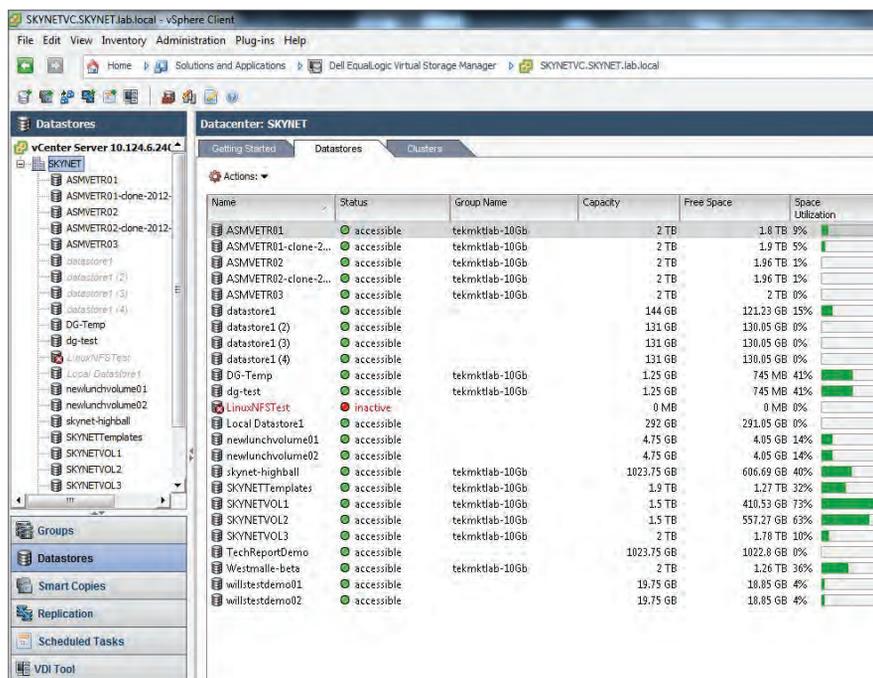


Figure 1. Dell EqualLogic Virtual Storage Manager is integrated with the VMware vCenter user interface to optimize storage management

Smart Copies can be grouped together on volumes according to protection level requirements. VSM maintains a Smart Copy database and is designed to verify each copy for data integrity.

The Smart Copy approach to data protection is SAN-based, as opposed to traditional host-based approaches. Because Smart Copies are created by the EqualLogic PS Series array, the host is not burdened with resource-hungry snapshot operations, avoiding impact on critical application performance. Additionally, Smart Copies store incrementally changed information, helping reduce the total storage capacity needed to achieve reliable data protection.

VSM provides highly granular control, allowing administrators to easily select a virtual machine, a set of virtual machines, or a datastore to be protected as necessary. In the event of data loss, administrators can use Smart Copies to restore the state to a specific point in time. For example, if a Smart Copy of a datastore of virtual machines was created, administrators can use that Smart Copy to restore an individual virtual machine or a set of virtual machines within the datastore.

For disaster tolerance, the VSM Smart Replica function uses EqualLogic Auto-Replication to replicate appropriate datastores from the primary EqualLogic PS Series group to a secondary recovery group that may be at a geographically remote location. Replication between different groups at disparate locations helps protect against disasters and data loss. If a volume goes offline, administrators can fail over to the recovery group and recover data from a replica. End users resume access on the recovery volume, and VSM replicates changes made to the recovery volume back to the original volume location when it becomes available. Administrators can then fail back to the primary group. This powerful replication capability is included with EqualLogic storage at no additional cost so organizations can simply and cost-effectively replicate their business-critical assets across locations.

Intuitive SAN and VMware vCenter-based navigation lets administrators easily create and manage schedules for Smart Copy, Smart Replica, and Smart Clone operations. Administrators can coordinate snapshot, replica, and clone creation across the virtual data center, leading to fast, reliable, and effective

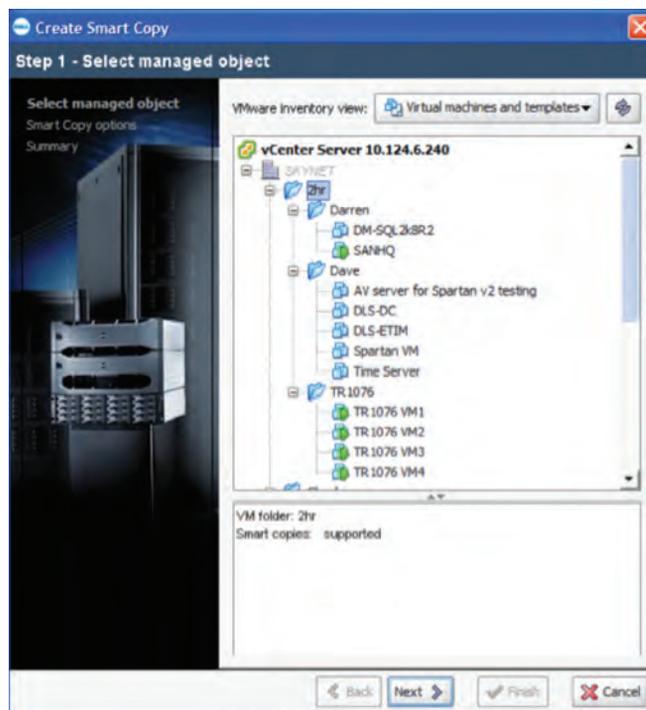


Figure 2. A step-by-step wizard makes it easy to create Smart Copies through the VSM interface

online data protection of the VMware vSphere virtualized environment.

### Expanding storage awareness in the virtualized environment

For further integration with a VMware vSphere environment, Dell EqualLogic VSM leverages the VMware vStorage APIs for Storage Awareness (VASA) to allow the EqualLogic array to communicate storage attributes to vSphere. These attributes—which include drive type, speed, RAID setting, and snapshot reserve space to name a few—allow vSphere to assess whether a storage array's physical components meet the needs of virtual machines according to predefined workload profiles.

This information enables vSphere to determine the automated placement of virtual machines based on workload and space constraints and intelligently migrate workloads across disparate physical resources. As a result, VSM helps achieve policy-driven workload automation to optimize latency, performance, and capacity utilization. This automation, along with alerts and event notifications, further supports the responsiveness and agility demanded by business-critical tier 1 applications.



### Rightsizing virtual desktop deployments

Dell EqualLogic VSM also facilitates the management of virtualized storage used in VDIs, which enterprises are deploying to support the challenges of modern mobile client computing. VSM enhances productivity by automating virtual machine pool creation, virtual machine registration, and patch and update management.

By leveraging leading-edge array-based cloning technology, VSM streamlines the provisioning of virtual desktops in VMware View™ VDIs. Because EqualLogic PS Series thin clones store only incremental changes to EqualLogic template volumes, they heighten space efficiency by avoiding data duplication. This technology minimizes VDI storage requirements and helps reduce total cost of ownership.

### Enhancing data availability and disaster management

Dell EqualLogic VSM is a component of the Dell EqualLogic Host Integration Tools for VMware, which are available at no additional cost to users of EqualLogic PS Series arrays. The EqualLogic Host Integration Tools for VMware include two other tools that enhance business continuity and support high levels of service.

Dell EqualLogic Multipath I/O (MPIO) for VMware enables VMware vSphere to intelligently leverage the scale-out storage architecture of EqualLogic PS Series arrays. This architecture is designed to automatically balance workloads by spreading data across multiple active storage resources and optimizing available network connections, cache, controller resources, and drives.

With shared storage, the paths from the servers to the storage must be redundant and highly available. MPIO provides multiple redundant network connections to storage arrays, as well as storage-aware, end-to-end management of data paths between the host and storage arrays.

As storage I/O requests are generated on the vSphere hosts, MPIO is designed to intelligently route these requests directly to the array member best suited to handle them. MPIO enables increased bandwidth, reduced network latency, automatic connection management, failover, and fault-tolerant load balancing—ultimately helping boost storage performance, scalability, and availability.

The second tool, the Dell EqualLogic Storage Replication Adapter (SRA) for VMware vCenter Site Recovery Manager (SRM), communicates with SRM through vStorage application programming interfaces (APIs). This combination offers centralized automated disaster management.

The SRA enables administrators to create and test recovery plans while avoiding impact to production environments. The SRA then utilizes VSM to help ensure virtual machine consistency and coordinate replication scheduling. It leverages the EqualLogic SAN-based Auto-Replication feature to replicate appropriate data to the recovery site. In the event of a disaster, the predefined recovery plans are executed for efficient failover to the recovery site. Also, the proactive failover feature helps organizations avoid service and data loss by enabling failover prior to a disaster.

Using the failback feature, administrators can set the system to fail back to production. The thin replication feature of EqualLogic storage means only changed blocks will be transmitted, leading to reduced network traffic and expediting the failback.

In traditional SAN environments, the cost, complexity, and burden on resources is often too high for many organizations to take advantage of replication. By leveraging the SRA and EqualLogic Auto-Replication—which is also available at no additional cost with EqualLogic PS Series arrays—organizations can simply and cost-efficiently implement disaster management capabilities that are resource optimized.

### Streamlining the deployment of virtualized environments

Dell EqualLogic virtualized storage is designed to help enterprises optimize their virtual deployments on an infrastructure that can scale without added complexity as requirements grow and change.

The automation and integration of storage management within the virtual infrastructure, enabled by EqualLogic VSM, leads to streamlined management, reliable data protection, and exceptional IT agility. By offering powerful storage management capabilities through the VMware vCenter interface, VSM helps bridge the gap between the virtual-infrastructure administrator and the storage administrator to save time and boost efficiency.

Furthermore, the use of Ethernet-based iSCSI connectivity and all-inclusive software features of EqualLogic PS Series arrays enhances performance while minimizing resource overhead and total cost. With EqualLogic PS Series storage powering VMware vSphere environments, enterprises can build a high-performance, cost-effective virtual infrastructure that is simple to manage and scale. 

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in a VMware environment:  
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# Sustain OLTP availability and performance with synchronous replication

By Magi Kapoor and Maggie Smith

Ensuring high availability of mission-critical OLTP applications is a necessity for many organizations. Dell™ EqualLogic™ Synchronous Replication (SyncRep) helps protect data and keep online transactions flowing without compromising performance.

## Dive deeper

SyncRep allows organizations to protect mission-critical application data within a campus environment. In this technical report, get a detailed look at the benchmark testing conducted using SyncRep on Dell EqualLogic PS Series arrays.

[qrs.ly/sj2y7i7](http://qrs.ly/sj2y7i7)

For many organizations, protecting transactional data and ensuring the availability of online transaction processing (OLTP) applications are crucial for delivering a consistent customer experience and maintaining business continuity. Whether organizations are offering online banking or selling airline tickets, downtime or interruptions can quickly lead to customer frustration and lost revenue.

IT groups must make sure that no mission-critical application data is lost and that users can continue to conduct transactions during either planned maintenance or unplanned outages. They need a data protection and recovery strategy that delivers a near-zero, or real-time, recovery point objective (RPO) for mission-critical applications—in other words, the OLTP application must be able to recover without any data loss. At the same time, they require a fast recovery time objective (RTO) to maintain availability and avoid service interruptions.

In many cases, organizations must weigh the cost of implementing technologies that can deliver a near-zero RPO and a fast RTO with the potential business costs of data unavailability or slow recovery from disasters. The technology cost associated with recovery generally decreases the longer an organization can wait for recovery, but the business cost—including productivity, customer retention, and revenue—increases the longer it takes to recover. The point where time and cost intersect helps organizations develop an optimal high-availability and data protection plan for mission-critical OLTP application environments (see Figure 1).

Storage-based synchronous replication—which is designed to write data to two separate storage arrays simultaneously—can play an important role in a high-availability and data protection plan. It offers an efficient, easy-to-use approach to delivering high availability and protecting data from loss for mission-critical OLTP applications. However, some organizations hesitate to implement

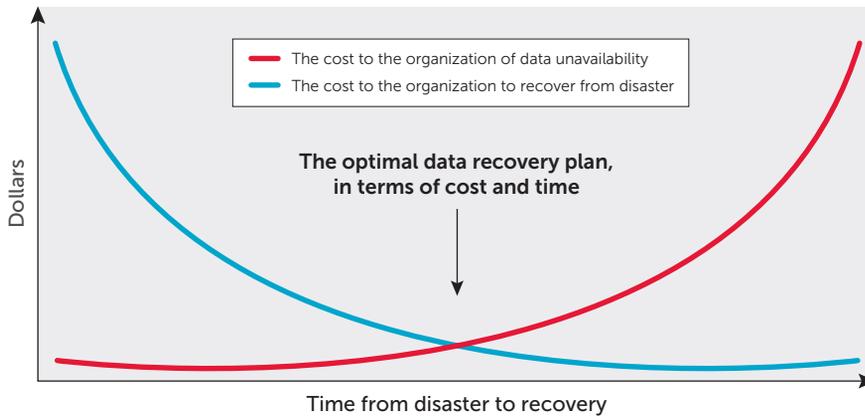


Figure 1. The costs of a data protection plan balanced with the business costs of data unavailability and slow recoverability

synchronous replication because of the potentially high cost of the required software and infrastructure.

Others are concerned over the impact of synchronous replication on application performance. If synchronous replication of data substantially slows database response time, it could cause downtime and negatively affect the user experience. Organizations need a cost-effective solution that can meet stringent RPO and RTO requirements while still delivering a suitably responsive experience to end users.

Dell EqualLogic PS Series Internet SCSI (iSCSI) storage area network (SAN) arrays help organizations address these challenges with the Synchronous Replication (SyncRep)

capabilities introduced in EqualLogic firmware v6.0. Included with EqualLogic storage at no additional cost, SyncRep enables organizations to achieve the RPOs and RTOs they need for mission-critical applications without significantly affecting application performance.

### Protecting data with synchronous replication

SyncRep is designed to write volume data simultaneously to two different storage pools in the same EqualLogic PS Series group (see Figure 2). Whether those storage pools are in the same data center, on different floors of the same building, or located across a campus, SyncRep enables data in both pools

to be kept up-to-date. The result is two hardware-independent copies of volume data. (For more information about the requirements for setting up SyncRep, see the sidebar, "Get ready to replicate.")

SyncRep is enabled on a per-volume basis. As a result, administrators gain the flexibility to select only certain applications that need synchronous protection—even if those applications are spread across a few volumes—rather than replicating the entire pool or array. Active volumes are located in the SyncActive pool, to which the hosts are connected when reading and writing volume data. When volume data is written to the SyncActive pool, the group is designed to simultaneously write the same data to SyncRep-enabled volumes in the SyncAlternate pool.

SyncRep avoids the data loss that can occur even in momentary outages. With SyncRep, the storage group acknowledges write completion only after data is written to both the active and alternate volumes, and that write is hardened in the protected cache of both systems. By prioritizing the writes over the acknowledgment, SyncRep helps ensure that no data is lost and that the two copies of data are up-to-date at all times.

The roles of the SyncActive and SyncAlternate pools can be switched. Changes made during the switchover are tracked and are used to update the SyncAlternate pool once the two pools are again in sync. The ability to easily switch pools helps administrators accommodate planned maintenance and sustain availability, even with the unavailability of an array member or pool.

Administrators also can manually fail over from the SyncActive to the SyncAlternate pool if the pools become out of sync as a result of a problem with a member, pool, or the networking infrastructure. Administrators can resume applications with minimal interruptions. Data loss is avoided because the new SyncActive pool (formerly the SyncAlternate pool) accepts writes and tracks

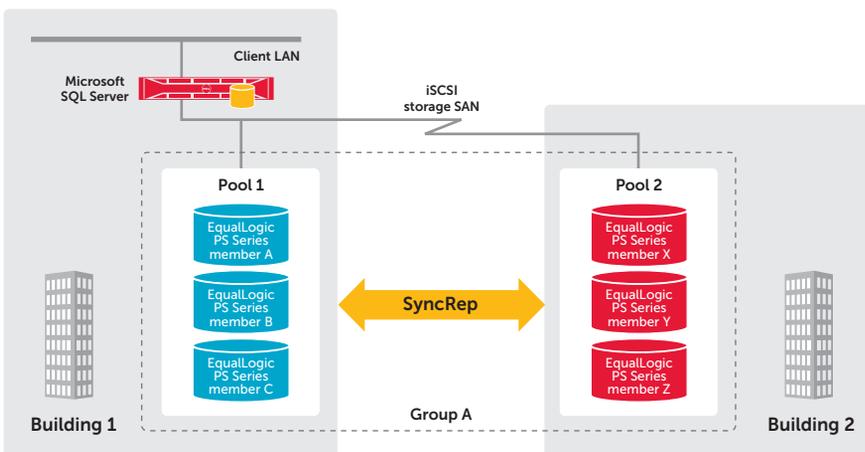
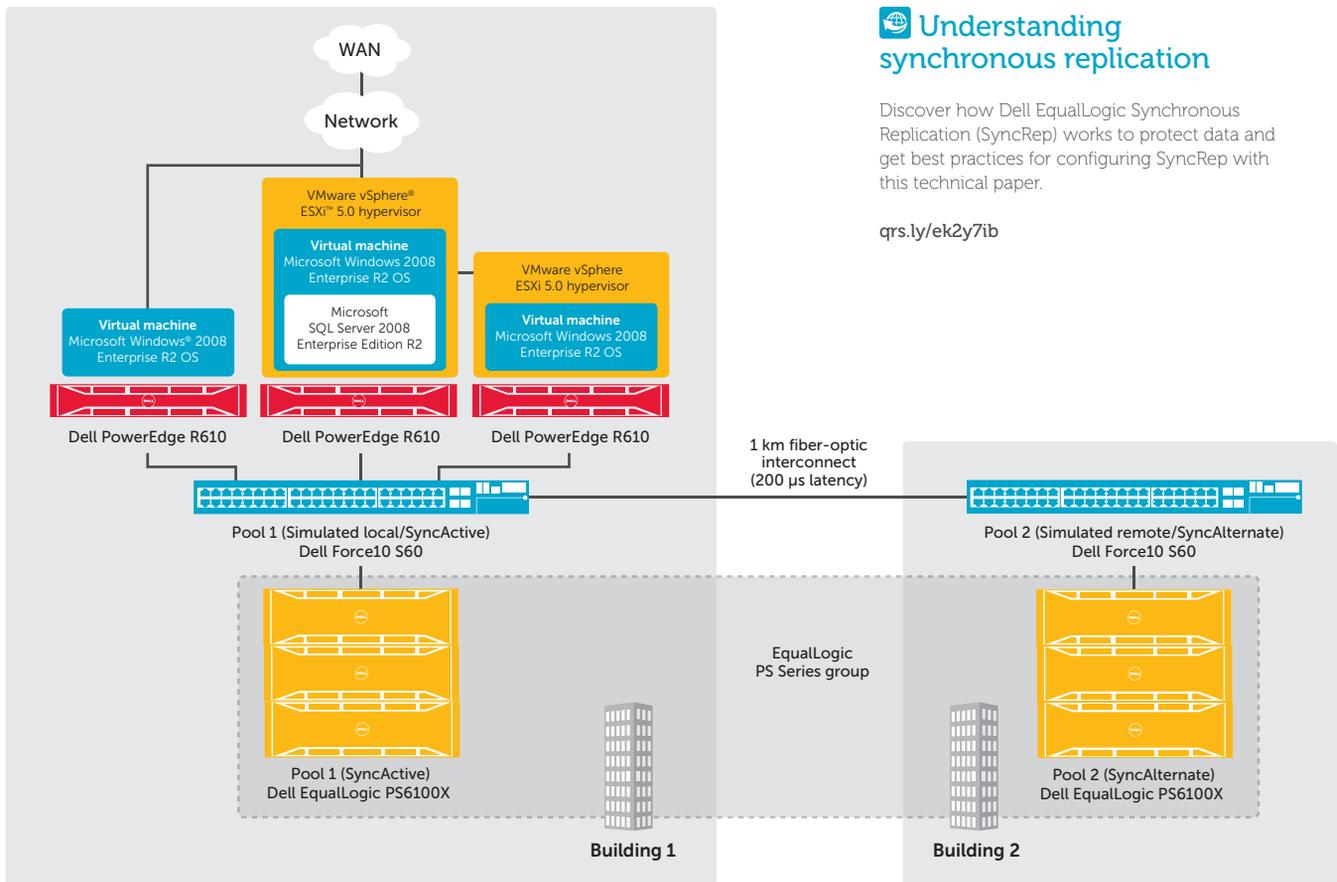


Figure 2. Data replication using SyncRep for campus data protection



## Understanding synchronous replication

Discover how Dell EqualLogic Synchronous Replication (SyncRep) works to protect data and get best practices for configuring SyncRep with this technical paper.

[qrs.ly/ek2y7ib](http://qrs.ly/ek2y7ib)

Figure 3. Configuration of the test environment for a synchronously replicated campus site

changes made while the original SyncActive copy is offline.

### Quantifying OLTP performance

In July and August 2012, Dell Labs tested SyncRep to demonstrate how using this EqualLogic capability in a mission-critical OLTP environment could help organizations protect data while maintaining exceptional performance. The primary goal was to compare the performance of a Microsoft® SQL Server® database environment with and without SyncRep enabled. To gauge the application performance, the testing team recorded application transactions per second (TPS) and overall application transaction response time. In addition, the team sought to determine whether performance changed as the user load on the array increased.

### Test configuration

To test a typical synchronous replication scenario in a campus environment, the team set up two storage pools, each using three EqualLogic PS6100X arrays. Microsoft SQL Server 2008 was hosted on a Dell PowerEdge™ R610 server and was connected to the SAN through four Gigabit Ethernet (GbE) network interface cards connected to a Dell Force10™ S60 switch. The pools were configured to be in the same storage group and were connected by a 1 km fiber-optic link, which resulted in a measured latency of 200 μs (see Figure 3).

The Dell Quest Benchmark Factory™ for Databases software was used to generate workloads for the Transaction Processing Performance Council Benchmark C (TPC-C), a commonly used OLTP benchmark that simulates an order-entry environment

where concurrent end users execute transactions against a database. To measure the performance of consolidated OLTP applications, four SQL Server 2008 databases, each totaling 550 GB, were created.

The testing team first generated a TPC-C–style database transactional workload on a single EqualLogic PS Series array without SyncRep enabled. They then gathered application transactions per second and end-to-end transaction response time data under increasing user load. Four TPC-C benchmark clients simultaneously ran against each of the four databases. Multiple virtual machines concurrently executed the TPC-C benchmark at increasing user loads.

Next, the test was repeated with SyncRep enabled for the storage group using two arrays. The benchmark was run



# Get ready to replicate

To implement Synchronous Replication (SyncRep), organizations need Dell EqualLogic PS Series array firmware v6.0 or higher. Two EqualLogic PS Series pools—one active and one alternate—must each contain at least one array member and be within the same EqualLogic group.

In addition, SyncRep requires fast, reliable connectivity between the two pools. The tolerance for latency in the network depends on the application using the volume—latency will be the gating factor for application write performance. Bandwidth of at least 1 Gbps is recommended between the pools. The pools can be in distinct buildings, but to help decrease the impact on application

performance, Dell best practices recommend that the pools be less than 1 km apart to minimize latency. However, organizations should account for the fact that latency is not only affected by distance but also by other factors, such as the number of hops, type of networking equipment, and so on. Since the two pools are in the same group, all members must be in the same virtual LAN (VLAN)/subnet, and a flat network infrastructure is required.

For more information about the technical requirements, download the white paper, "Protecting Microsoft SQL Server databases with EqualLogic Synchronous Replication," [qrs.ly/sj2y7i7](http://qrs.ly/sj2y7i7).

on a single array and writes were replicated to the second array using SyncRep.

## Test results

The benchmark tests showed that using SyncRep to replicate data to a second pool had a negligible impact on the application's average transactions-per-second performance and the average response time (see Figure 4). The test also showed that the performance impact did not increase appreciably as the user load increased. Even with a large user load, the average response time remained well within an acceptable range for delivering a robust, responsive user experience.

These results have important implications for organizations using mission-critical

OLTP applications. In the travel industry, for example, an airline could help ensure that online customers find a flight, buy a ticket, select a seat, and make any additional travel arrangements without interruptions or errors that might force them to start over or move to a competing site. Customers would be able to enjoy a rapid response time, even during busy periods when the number of online users increases.

## Balancing data protection and performance

For mission-critical OLTP applications, organizations need ways to protect data from loss and maintain availability as well as performance. By implementing the SyncRep capabilities built into EqualLogic PS Series

SAN arrays, organizations can capitalize on synchronous replication to avoid data loss and maintain high availability of OLTP applications.

Importantly, testing demonstrates that SyncRep enables organizations to achieve zero RPO without sacrificing performance. And because SyncRep is available as part of the comprehensive software set provided with EqualLogic storage at no additional cost, organizations can avoid licensing costs for synchronous replication capabilities. Adopting SyncRep with EqualLogic storage enables organizations to strike the right balance of data protection, availability, cost, and performance for their OLTP applications. **PS**

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## Learn more

Dell EqualLogic storage: [equallogic.com](http://equallogic.com)

Dell EqualLogic PS Series in a SQL Server environment: [qrs.ly/a22y7ie](http://qrs.ly/a22y7ie)

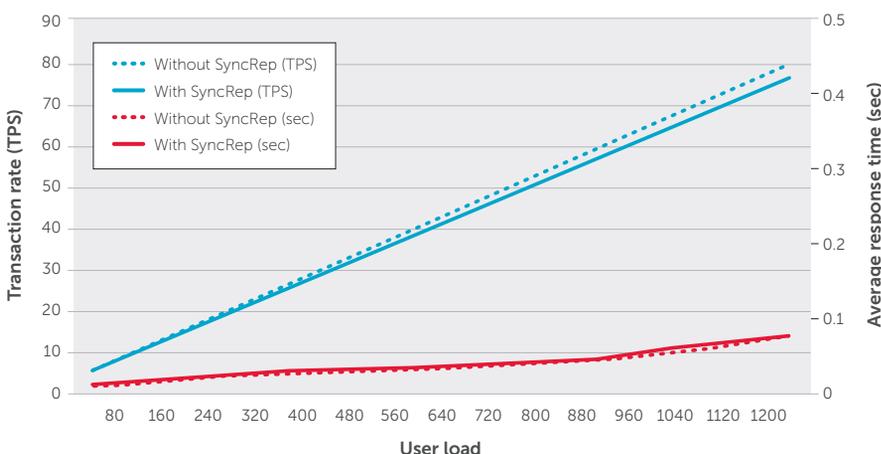


Figure 4. Impact of SyncRep on transactions per second and average response time



# Introducing scalable Schneider Electric data center facility modules

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After pioneering modularity within the data center's traditional IT space, Schneider Electric™ now brings the modular approach to the facility domains of data center physical infrastructure. This design/build approach transfers the time intensive engineering and pretesting of facility-related data center components to the "factory," in turn making large data center deployment fast and easy. It also allows right-sized deployment today, while enabling quick capacity changes tomorrow.

## Fast, easy, cost-effective deployment

Schneider Electric facility modules, which include a power unit and two types of cooling (water chiller or air) units, complement IT containers to give companies the complete infrastructure support they need to add capacity to existing data centers or to turn available space (e.g., former warehouses or manufacturing plants) into highly available, energy-efficient, world-class data centers in just weeks. This scalable approach speeds up deployment, lowers costs, and simplifies the build process. Accordingly, data centers can move at the speed of business at all times — with the flexibility to adapt to future business needs.

Schneider Electric data center facility modules represent the future of large data centers — delivered today!

## Business-wise, Future-driven.™



## Our step and repeat approach

Now, grow your facility-level power and cooling capacity in 500 kW increments as you need it.

- > Pretested, prewired, and UL-rated to reduce overall data center design and deployment time to weeks
- > CapEx cost savings range from 10 to 20 percent, and OpEx savings range from 20 to 35 percent
- > Rightsizing, or matching power and cooling to the exact IT loads, optimizes PUEs
- > The pre-engineered modules can be deployed according to the data center's specific redundancy needs



## Discover best practices!

Learn more in "Containerized Power and Cooling Modules for Data Centers" (WP #163).

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## Vail Resorts

# Peak performance

To heighten the slope-side experience for visitors in a fiercely competitive market, Vail Resorts offers an innovative, storage-intensive social networking app using Dell™ Compellent™ storage with automated data tiering and simplified storage management.



Operating resorts that cater primarily to downhill skiers, snowboarders, and other winter sports enthusiasts is a precarious undertaking. Unseasonal warm spells and other weather-related factors can make or break the season. And even when the base is deep and the powder is aplenty, the competition among winter resorts can be fierce. With more than 500 ski areas operating in North America, it takes creativity and innovation to stand out from the crowd.

Vail Resorts, Inc.—with ski area properties in Vail, Beaver Creek, Breckenridge, and Keystone in Colorado, and in Heavenly, Northstar, and Kirkwood in the Lake Tahoe area—is continuously innovating operations to enhance its visitors' experience on the slopes. One of the resort chain's innovations

is the EpicMix application. Utilizing personalized dashboards, the application offers season-pass holders a way to track where and when they have skied. The system utilizes radio frequency identification (RFID) technology inside the pass to track statistics such as vertical feet traveled and enables skiers to earn digital ski pins for milestones they achieve. It can post this information to Facebook if skiers choose. Families and friends who sign up for EpicMix notifications can even use Facebook to track where others in their group are on the mountain, simply by viewing which lift they last rode.

### Empowering epic innovations

EpicMix is just one example of how Vail Resorts began to rely increasingly on technology to



“A lot of people love the EpicMix photo application. This enhanced customer experience is made possible by our Dell Compellent storage solution.”

—Mike Bahr  
IT manager at Vail Resorts  
September 2012

We add data to our tier 1, 15,000 rpm SAS drives.” Bahr adds that if the data doesn’t need that level of performance, Dell Compellent Data Progression™ storage tiering software automatically migrates it down to the tier 3, 10,000 rpm Serial ATA (SATA) drives. And if the data needs increased performance later on, it is automatically moved back up to tier 1.

“Performance is very important for our virtual environment,” Bahr says. “We’ve got about 200 virtual machines running off the storage system. If performance starts to lag, a lot of different teams in our company will be affected, either by loss of productivity for individual users or inconvenience to the customer if it affects one of our Web sites. We’ve achieved excellent performance with the Dell Compellent SAN; we don’t ever have to worry about the I/O requirements for individual applications on our virtual platform.”

By utilizing Dell Compellent Dynamic Capacity™ thin provisioning software, Vail Resorts is delaying procurement of additional storage capacity in its data tiers. “Now, a year after implementation of the storage solution, we’re using 67 percent of its total capacity. Twenty-eight percent is allocated but still free, and just under 5 percent is unallocated. If we weren’t using thin provisioning, we would essentially be fully allocated, and we would again be shopping for more disk capacity. We’re saving money by delaying purchase of additional storage because we use Dell Compellent Dynamic Capacity,” Bahr says.

enhance the customer experience and gain a competitive advantage. To bolster its infrastructure, the company started virtualizing its back-end applications in a VMware® virtualization environment. A key concern for their virtual platform rollout was replacing an existing storage area network (SAN). After considering several alternatives, Vail Resorts chose the Dell Compellent Storage Center™ SAN array.

“The automated data tiering and simplified storage management are the two biggest reasons we chose Dell Compellent storage,” says Mike Bahr, IT manager at Vail Resorts. “We really like the idea that we don’t have to worry about what data goes where.

### Viewing photos within the hour—on a smartphone

EpicMix has been a hit with guests since its launch two years ago. Phase two of the application’s deployment incorporated slope-side photographs into the offering. Bahr explains that many ski resorts have photographers on the slopes who take photographs of skiers and snowboarders. At the end of their day, the photographers load the images on the computer and process them. When skiers and snowboarders are done for the day, they can go to the resort’s ski shop and look at their pictures.

Vail Resorts updated this approach. According to Bahr, the photographers now use RFID-enabled cameras. “When they take pictures on the mountain, the camera scans the skier’s RFID tag and registers who is in the photo,” says Bahr. “The photographer wirelessly uploads it to our application, and it is tied to the skier’s EpicMix dashboard. Within an hour in most cases, the skier can see the photos on a smartphone. Guests can order full-size hard copies, or they can share the thumbnails through Facebook or Twitter.”

The EpicMix photo application runs on the Microsoft® Windows Server® 2008 R2 OS and utilizes Microsoft SQL Server® database, Microsoft Internet Information Services (IIS), and Microsoft .NET Framework software. To roll it out, Vail Resorts required a large amount of disk space. “For each picture that our



photographers take, we have an original and copies that are rendered,” Bahr says. “The photo gets rendered with a logo. It gets rendered into thumbnail-size images. We end up storing 12 copies of every photo that is taken on the mountain. We estimated that we were going to need 30 additional terabytes of storage.”

“With no increase in staff, we’re managing twice as much space, twice as many hosts, and twice as many virtual machines because of the streamlined administration of our Dell Compellent storage.”

—Mike Bahr

IT manager at Vail Resorts  
September 2012

The company initially considered cloud storage but decided to expand storage inside its data center. “We knew our Dell Compellent solution could handle the photo project,” says Bahr. “We weren’t sure how much capacity we would need, but we knew that our Dell Compellent volume could grow to 200 TB if it needed to. When we purchased the SAN, we didn’t know how quickly our data volume would grow or how much storage we would really need. We initially purchased 40 TB. A little over a year later, we’re up to 142 TB in our primary SAN and 100 TB in a secondary unit.”

### Streamlining data administration and protection

Despite its modernized environment growing twofold compared with its legacy environment, Vail Resorts continues to utilize only one dedicated storage administrator. In addition, Dell Compellent Enterprise Manager software streamlines system management. “With no increase in staff, we’re managing twice as much space, twice as many hosts, and twice as many virtual machines because of the streamlined administration of our Dell Compellent storage,” Bahr says.

Vail Resorts also supports its environment with SAN-level data protection, replication, and recovery—capabilities its legacy environment did not have. It now uses Dell Compellent Remote Instant Replay™ software for data protection. “We tried to deploy replication using software tools on the server side, but that solution was unable to keep up with our photo volume,” Bahr reports. “We decided to move to Dell Compellent replication. We’re now replicating about 30 TB between our SANs. It’s been working flawlessly. Previously, we used other data protection technologies, and we were shooting for a recovery time of 30 minutes to an hour. We’ve practiced restoring a Dell Compellent Replay, and we’ve demonstrated that we can now recover a virtual machine in 5 to 10 minutes.”

### Enjoying technology-driven support on the slopes

Many Vail Resorts customers use EpicMix to track and share their activities on the mountain. The application generated more than 1.5 million guest posts to Facebook and Twitter in a recent ski season. Skiers in droves are also taking advantage of the ability to quickly share their vacation photos. “A lot of people love the EpicMix photo application,” Bahr says. “This enhanced customer experience is made possible by our Dell Compellent storage solution.” 

### Standout capacity for innovation

The Dell Compellent Storage Center storage area network (SAN) can deliver a platform that scales efficiently and readily supports a storage-intensive photo-sharing application for skiers and snowboarders visiting Vail Resorts–owned ski areas.

67%

Dell Compellent Dynamic Capacity thin provisioning facilitated Vail Resorts using only 67 percent of its total Compellent storage capacity one year after deployment.

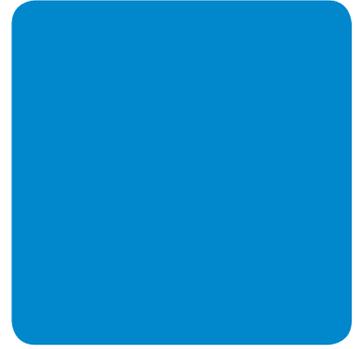
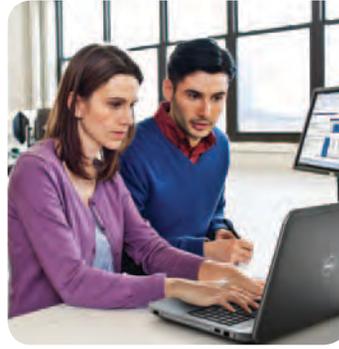
200 TB

Vail Resorts expanded Dell Compellent storage capacity to 200 TB in its data center to support efficient handling of its EpicMix app and photo project for enhancing visitors’ slope-side experience.

5–10 minutes

Recovering a virtual machine using a Dell Compellent Replay took 5 to 10 minutes, helping Vail Resorts significantly reduce the 30-minute-to-one-hour recovery time it had experienced with non-SAN-level replication.

# Dell PowerVault tape solutions



## Cost-effective data protection and preservation

Organizations need to protect and preserve more data for longer periods of time than ever before. Dell™ PowerVault™ tape solutions help address storage challenges by offering a robust, reliable, and cost-effective way to back up and archive data. Next-generation PowerVault tape solutions capitalize on LTO-6 technology to help increase capacity, improve performance, and lower TCO. To optimize data protection, PowerVault tape solutions complement Dell disk-based storage. High data transfer rates make tape well suited for large-scale recovery and long-term data archiving.

For more information, visit  
[qrs.ly/332i3ff](https://qrs.ly/332i3ff)

### Robust data protection

Tape can be moved off-site and stored in a secure location. Encryption helps ensure data privacy while support for WORM tape media is designed to prevent overwriting of stored data and helps meet regulatory compliance.

### Big capacity, small footprint

LTO-6 technology features a native data capacity of up to 2.5 TB per cartridge—helping organizations cost-effectively accommodate large data volumes in the compact form factor of PowerVault tape solutions.

### High performance

PowerVault LTO-6 tape solutions are engineered to achieve data transfer rates of up to 576 GB/hour to minimize backup windows and accelerate data recovery.

### Exceptional dependability and compatibility

Designed for a typical shelf life of over 20 years, tape is practical for long-term archiving. Backward compatibility of LTO technology helps preserve investments in prior-generation tape media.





## Europcar South Africa

# Accelerating performance through a private cloud

Europcar South Africa drives IT agility by building a private cloud that delivers services on the fly and boosts staff productivity, helping the car rental company increase customer loyalty and attract new clients.



In the car rental business, efficiency is the key to success, enabling competitive pricing and the delivery of services that help build customer loyalty. Accordingly, Europcar South Africa has developed a highly efficient business operation by supporting personnel and customers with cutting-edge IT. As Shaun Phillips, general manager of IT operations and infrastructure, puts it, "Our business is incredibly price sensitive, so we have to keep a tight control of costs. And the best way to do that is by driving efficiency through the use of technology."

### Next-generation infrastructure brings efficiency today

Europcar had virtualized the majority of its data center using Dell™ technology and Microsoft® software, installing Dell PowerEdge™ servers and Dell EqualLogic™ storage arrays, with the Microsoft Windows Server® 2008 R2 OS and Microsoft Hyper-V® hypervisor delivering the virtual layer. But Phillips envisaged building a private cloud environment to create an IT infrastructure that scaled up and down with business needs. "The idea was to deliver a really agile IT service: one that could meet the requirements of personnel and

## Destination private cloud

Europcar South Africa looked to get ahead in a competitive market by developing a flexible IT service that could scale in line with demand across the business. By creating an efficient private cloud infrastructure, Europcar was able to boost business agility and enhance customer services.

# 90%

With a productivity boost of 90 percent, the company's IT team can devote time to projects that drive innovation.

# 45%

Europcar has enhanced business agility by cutting the time required to launch a virtual machine by 45 percent.

# 15 minutes

In the event of disaster, the private cloud enables the IT team to get systems up and running in 15 minutes, down from two hours.

customers at the moment they needed it," he says.

Europcar lost no time choosing a provider to help build its cloud. "I've been a Dell guy for more than 11 years and have used its solutions in multiple industries around the world," says Phillips. "Support is always excellent wherever you go." He also liked the fact that Dell and Microsoft have a strategic partnership. "We get more than simply end-to-end IT solutions from Dell," says Phillips. "It also facilitates relationships with its strategic partners like Microsoft, helping us quickly gain support from the experts we need."

Phillips had the opportunity to develop the private cloud infrastructure using its existing infrastructure, adding Dell PowerEdge 12th-generation servers running the Microsoft Windows Server 2012 OS.

### Virtualization boosts business agility

Among a tough field of competition, Europcar has heightened its agility with the deployment of the private cloud, so that IT services can be added quickly for staff and clients. And by raising the role of automation in the creation of virtual servers, Europcar has cut the time required for launching a virtual machine by about 45 percent. Phillips says, "With our Dell

platform running Windows Server 2012, we can launch virtual machines in no more than 25 minutes, whereas it used to take 45 minutes."

With the release of Windows Server 2012 with Hyper-V, Europcar has been able to virtualize its line-of-business applications. "All our major business applications are in our Dell-based private cloud," says Phillips. "We're more competitive, because we don't need to spend money every time we want to scale or launch a new server."

In the event of service disruption, the company's IT team can get systems up and running more quickly than ever, thanks to its private cloud—vital for a business in which every minute of downtime represents missed customers and lost revenues. Phillips says, "Disaster recovery has gone down from around two hours to 15 minutes with our private cloud based on Dell and Windows Server 2012."

The IT team can manually fail over virtual machines at the primary site to the secondary site, minimizing disruption to business activities. Phillips adds, "We can also perform live migrations of our clustered environment simultaneously between sites for better business continuity with our private cloud from Dell."

### IT team enjoys enhanced productivity

When Europcar switched to a virtualized Dell infrastructure, the IT team significantly boosted its productivity and found that it could focus on high-value tasks instead of day-to-day maintenance. With the development of the private cloud, the team has raised its productivity further, so that it can deliver even greater value to the company. "Our IT productivity has gone up by around 90 percent to what it was before we introduced virtualization," says Phillips. "We can now focus more time on developing better IT services for our end users, as a result of building our private cloud on Dell and Windows Server 2012."

Phillips believes it will be easy to develop the private cloud as the business evolves because of the spare capacity available on the PowerEdge host servers. He feels that the cloud infrastructure can continue to deliver the same level of performance for years to come, as a result of working with Dell Support Services. "We have the confidence to keep innovating our IT with Dell ProSupport," says Phillips. "The service gives you responsive support, but also advice and assistance in developing your systems in line with business needs." 



Community Bank & Trust of Florida

## Cashing in on virtual infrastructure

Community Bank & Trust of Florida shores up data protection while lowering costs by setting up a virtual infrastructure that provides enhanced data integrity and accessibility for off-site backup and recovery.



Post-financial crisis, banks face an assortment of challenges as they deal with economic uncertainty, demanding customers, and shifting regulations. To remain competitive and compliant, banks need to focus on reducing complexity in daily operations as well as in disaster recovery.

"Several years ago, our biggest challenge was fully testing our disaster recovery site: bringing it online, watching it run, and leaving an audit trail for the test," says Jeff Stafford, senior vice president and senior technology officer for Community Bank & Trust of Florida. "Here in Ocala, hurricanes are a very real threat, so we have to know that our disaster recovery solution works."

However, the bank couldn't run tests as often as it wanted. "Examiners would like community banks to test disaster recovery multiple times a year and after any major infrastructure change," Stafford says. "Disaster recovery testing was expensive, so we only tested once a year. In addition, our data center consisted of a bunch of dedicated physical servers with direct attach storage. This infrastructure made disaster recovery very difficult to manage."

For an infrastructure refresh, the bank wanted to get away from physical servers and distributed storage. Stafford adds, "In addition to the disaster recovery challenges, we were spending too much time managing the servers, storage, and other hardware."

## Extra credit

Built on Dell servers and storage, the virtual infrastructure of Community Bank & Trust of Florida helped the company save time and money in today's increasingly competitive marketplace—while enhancing the availability of critical data.

# \$15,000

Since deploying a virtual infrastructure, Community Bank & Trust of Florida saved more than US\$15,000 a year on electricity costs alone.

# 70%

By using Dell AppAssure deduplication and compression, the bank has seen a 70 percent savings of storage space required.

# 5 minutes

The bank achieved a recovery point objective (RPO) of five minutes for critical data, as well as a recovery time objective (RTO) of two hours.

Stafford and his team selected the Dell™ EqualLogic™ PS Series Internet SCSI (iSCSI) storage area network (SAN) for its simplicity of management. "Another important factor was the fact that EqualLogic came with all the functionality we needed," Stafford says. "Replication, snapshotting, and thin provisioning are all included in the purchase price of the Dell EqualLogic arrays."

### Investing in data protection

Stafford and his team launched the VMware vSphere® virtualization platform on a Dell-based infrastructure that included Dell PowerEdge™ servers and Dell EqualLogic PS Series SANs. They then began virtualizing business-critical systems.

"The first benefit we noticed was a huge reduction in our consumption of power and cooling, plus savings on floor space and rack space," Stafford says. "Compared with our legacy environment, we're saving over US\$15,000 a year on electricity, and we've reduced our cooling needs by 25 percent. We've also seen increased efficiency in systems management. Storage administration takes about 75 percent less time than it did in our legacy environment."

Availability has also increased. "In the three years since Dell helped us virtualize

our servers, we haven't had any failures at the SAN or virtual machine level that have affected our production environment," Stafford says. "We've developed a highly stable environment, allowing us to better serve our customers."

Perhaps most critical for the bank, the virtual infrastructure greatly helps simplify disaster recovery. Dell EqualLogic Auto-Snapshot Manager automates SAN-level replication between the bank's data centers. "The SAN-level replication is seamless," Stafford says.

### Working better together

The bank implemented Dell AppAssure™ software for fast restores. AppAssure creates snapshots and replicates them to a Dell PowerVault™ MD1000 storage array in the bank's primary data center while replicating each virtual machine to the bank's disaster recovery site. Critical data is replicated every five minutes. "With AppAssure, we can bring a virtual machine online and have full access to it within just a couple of minutes," says Stafford.

To bring the entire disaster recovery site online, the bank uses VMware® vCenter™ Site Recovery Manager (SRM) along with Dell EqualLogic replication. "We are confident that if our main data center

burned to the ground or were leveled by a hurricane, we could bring our disaster recovery site online very quickly and effortlessly," says Stafford.

The AppAssure deduplication and compression functionality reduces 13 TB of backups to only 4 TB. "It's about a 70 percent savings on storage," says Stafford. "Our data gets to the disaster recovery site in a reasonable time, and we're saving money on storage capacity for our backup systems. We also have less data passing through the pipe to our secondary data center." Consequently, the bank has achieved a recovery point objective (RPO) of five minutes for critical data, and a recovery time objective (RTO) of two hours.

For its servers and EqualLogic SANs, Community Bank & Trust of Florida uses Dell ProSupport. "Dell ProSupport has always been excellent," Stafford says. "The large product offerings and great technical support are the primary reasons we work with Dell. Any time we've had an issue, Dell has been there for us. We're in a great position for compliance because of how Dell EqualLogic storage and Dell AppAssure work together. When everything is working this well, why would we change?" 



## 24\7 Inteligência Digital

# Getting the big picture

Digital asset management company 24\7 Inteligência Digital swaps out its storage network for a Dell™ Compellent™-based replacement, boosting data-serving speeds while significantly reducing processing times—resulting in a dramatic revenue increase.

Storage is serious business for 24\7 Inteligência Digital (24\7id), a pioneer of digital asset management in Brazil. The company offers strategic consulting services, brand management, and postproduction touch-ups of images, as well as aspert\, a Web-based system for clients to store image, audio, and video files.

When 24\7id launched, it purchased a storage area network (SAN) and gateway as storage for its large volume of digital media files. Unfortunately, rollout proceeded poorly: after a year, performance still wasn't sufficient to meet the company's needs. "The copy processes never ran faster than 20–30 Mbps," says Marco Pozam, CIO at 24\7id. "Performance is a critical factor for success in our business and to support our customers, because we have in a typical day's operation more than 47 TB in high-scale files. If this scenario does not operate with great performance, customers will decide not to use the 24\7id business applications in their daily core business."

The company evaluated alternatives from several storage vendors. "As we did our due diligence, we were impressed with the presales process at Dell," says Pozam. "The Dell Compellent technical team asked us about our needs and developed a solution for us based on that needs assessment."

The company required high data-access speeds, and the Dell Compellent Storage Center™ SAN array fit the bill. "Dell Compellent was the only solution we evaluated that was able to provide this level of performance," says Pozam.

### Accelerating deployment and performance

The company worked with Dell Implementation Services to deploy Compellent storage with 12 Serial Attached SCSI (SAS) disks and 36 nearline SAS disks. For file serving, it deployed Symantec™ FileStore software on a pair of Dell PowerEdge™ R610 servers. Two Dell PowerConnect™ 8024F switches tie the storage to the company's 10 Gigabit Ethernet (10GbE) network.

Dell Implementation Services installed and configured all the hardware. "We were very pleased with the quality of Dell Compellent services," says Pozam.



"The deployment went smoothly, and everything was delivered within the promised time frame. The solution was fully functional in just 40 days, compared with the year we spent trying to make the legacy SAN solution work."

The performance of Storage Center exceeded expectations. "Just the transition from the 8 Gbps Fibre Channel of the third-party SAN to the 10 Gbps Internet SCSI (iSCSI) of the Dell Compellent solution has provided a noticeable performance gain," Pozam says. "This alone has increased the performance of data access by 25 percent."

Dell Compellent Data Progression™ software automatically moves important and frequently accessed files to the fast tier 1 SAS disk. "We improved performance more than tenfold by moving our data to Dell Compellent," says Pozam. "With our previous



### Drawing on the returns

The Dell Compellent Storage Center array enabled 24\7 Inteligência Digital (24\7id) to achieve a 57 percent increase in revenues—a figure accompanied by equally impressive time savings and performance gains.

**80%**

Generating movie previews using the Storage Center-based environment took less than 20 percent of the time needed in the previous SAN environment.

**10x**

The company's previous storage moved data at 30 Mbps, whereas Storage Center reaches around 450 Mbps—a tenfold improvement in performance.

**29%**

After installing Storage Center, 24\7id saw a 29 percent reduction in time spent on internal IT staff operations.

storage solution, our copies moved at 30 Mbps, at most, while the new solution reaches around 450 Mbps.”

The faster storage solution is having a direct impact on the business.

“For example, in our previous SAN environment, generating movie previews under normal circumstances took 23 hours of processing time for a client with high volumes,” Pozam says. “This task takes about 4 hours using our new Dell Compellent-based storage infrastructure. That’s a reduction of more than 80 percent. The impact in business operations can be seen in the improvement of the total cost of ownership in the digital assets of our

customers, the 57 percent increase in our revenues in 2011, and 29 percent time savings in our internal IT staff operations.”

#### Maintaining high availability

The company has Dell ProSupport Mission Critical with four-hour on-site response for its servers and Dell Compellent Copilot Support for the SAN. “Having access to Dell Support Services gives us a lot of confidence,” Pozam says. “But in the eight months that this solution has been live, we haven’t yet had to call for support.”

Not only are all hardware purchases at 24\7id standardized with Dell, but the firm acquires its VMware®, Microsoft®, and Symantec licenses through Dell as well.

“The decision to standardize with Dell was based on our experience with a lot of IT companies in the last three years,” says Pozam. “Dell was the only supplier capable of understanding and delivering this holistic and agnostic vision of IT technologies, providing a correct understanding about what, why, when, where, who, how, and how much we need.”

Within a connected world where business organizations cannot be far removed from their customers, 24\7id believes that its successful relationship with Dell is based on maintaining trust and a positive and profitable relationship to both companies, rather than simply buying and selling products. 



# Data explosion calls for storage innovation

Today's organizations face a constant struggle to manage and protect data. In fact, Enterprise Strategy Group (ESG) research shows that 90 percent of organizations surveyed are increasing or maintaining their spending on storage infrastructure.<sup>1</sup> The volume of data continues to expand drastically as organizations gather increasing amounts of information and rely on digital processes to run their businesses. Technologies such as virtualization and cloud computing also demand scalable storage resources that are centralized and shared. Now, intelligent storage technologies,

such as scale-out and unified storage, are emerging to address those needs. The challenge for organizations is to contain costs while adopting advanced storage technologies to manage data growth.

More than one-quarter (28 percent) of respondents are currently using unified storage, a technology that consolidates file-based network attached storage (NAS) and block-based storage area networks (SANs).<sup>2</sup> By combining NAS and SAN, unified storage helps improve capacity

utilization and simplify management, among other operational efficiencies. ESG's research shows that unified storage is well received, and it has the potential for widespread adoption.

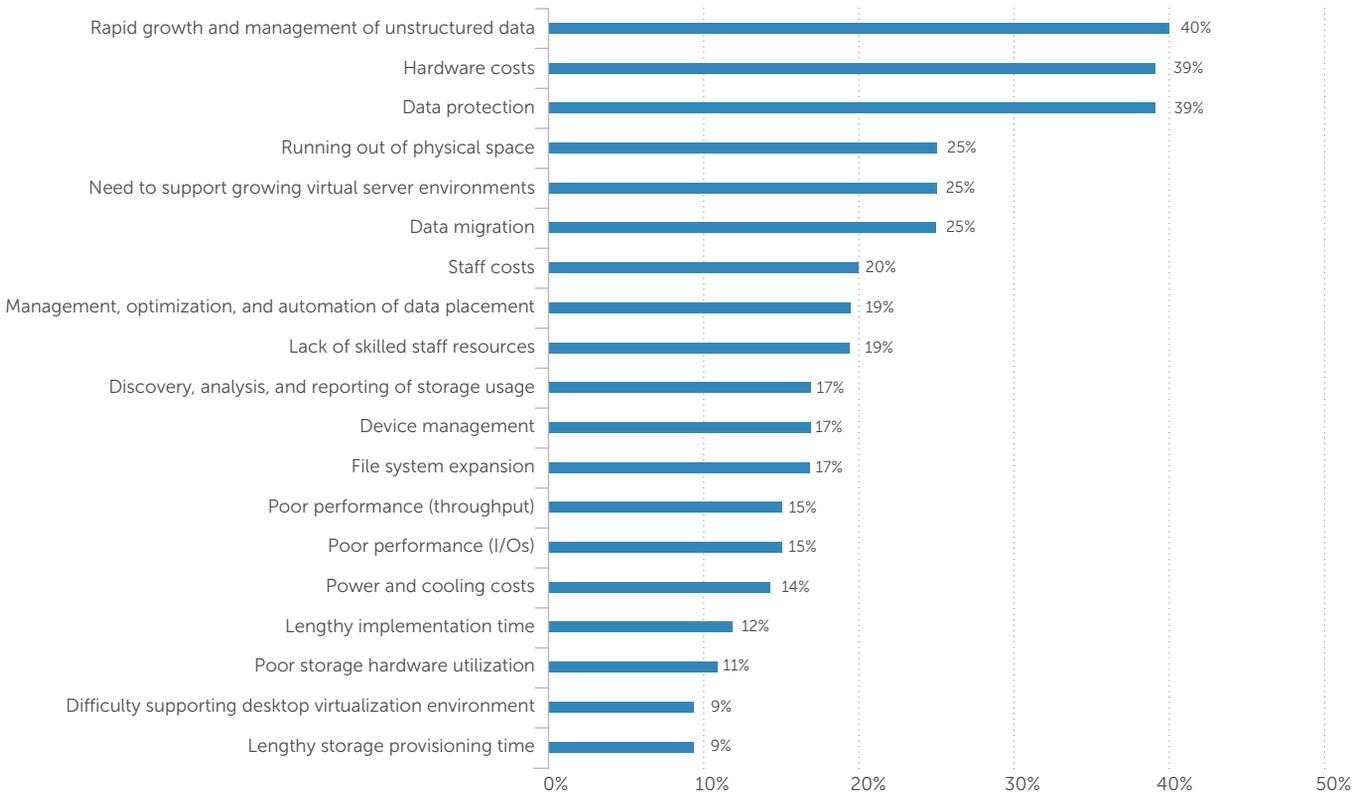
When evaluating storage products, many organizations consider total cost of ownership (TCO) as a major factor. Over half (65 percent) of the respondents indicated that capital expenditure—specifically, the cost of the storage infrastructure—was the most important cost consideration.<sup>3</sup> Because intelligent storage is designed to optimize the utilization of existing capacity, it helps rein in storage costs and enables businesses to defer capital expenditures on storage.

<sup>1</sup> "Research Report: 2012 IT Spending Intentions Survey," by Bill Lundell and John McKnight with Jennifer Gahn and Kristine Kao, Enterprise Strategy Group, January 2012, [qrs.ly/qx2z6av](http://qrs.ly/qx2z6av).

<sup>2,3</sup> "Research Report: 2012 Storage Market Survey," by Bill Lundell and Mark Peters with Jennifer Gahn, Enterprise Strategy Group, November 2012, [qrs.ly/hf2z6ay](http://qrs.ly/hf2z6ay).

## Biggest storage challenges

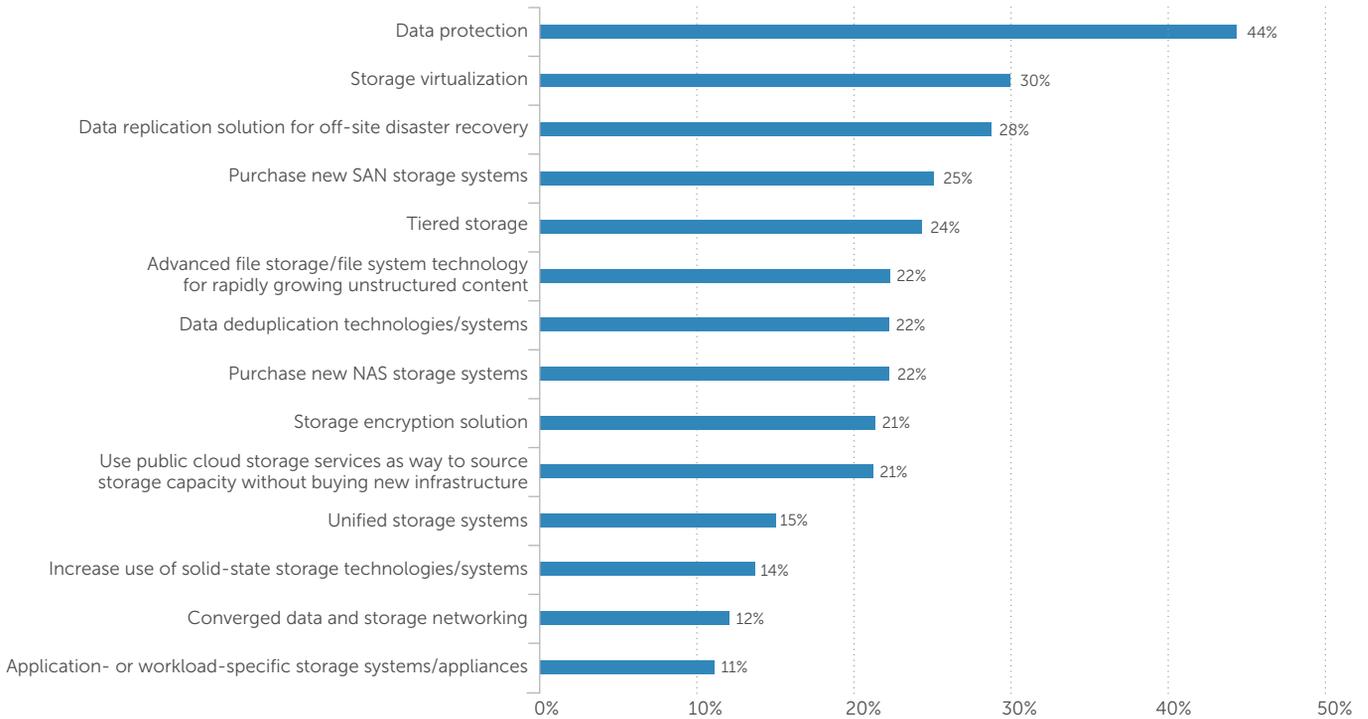
In general, what would you say are your organization's biggest challenges in terms of its storage environment? (Percent of respondents, N = 418)\*



\*Figure based on research that appears in "Research Report: 2012 Storage Market Survey," November 2012, [qrs.ly/hf2z6ay](http://qrs.ly/hf2z6ay).

## Storage-specific investments over the next 12 months

In which of the following data storage infrastructure areas will your organization make the most significant investments over the next 12 months? (Percent of respondents, N = 296, five responses accepted)\*

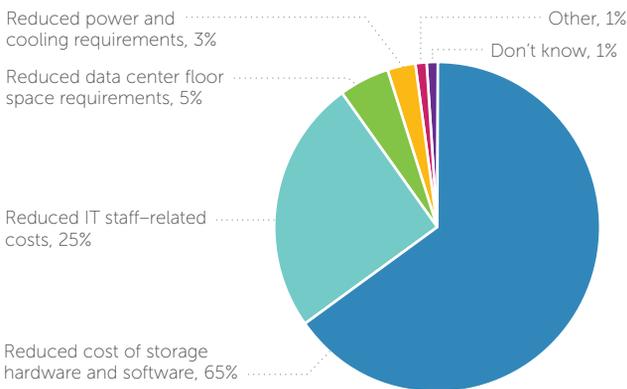


\*Figure based on research that appears in "Research Brief: 2012 Storage Infrastructure Spending Trends," March 2012, qrs.ly/512z6az.

## Important cost considerations for storage TCO calculation

Which of the following cost considerations that factor into a TCO calculation would you consider to be the most important?

(Percent of respondents, N = 271)\*

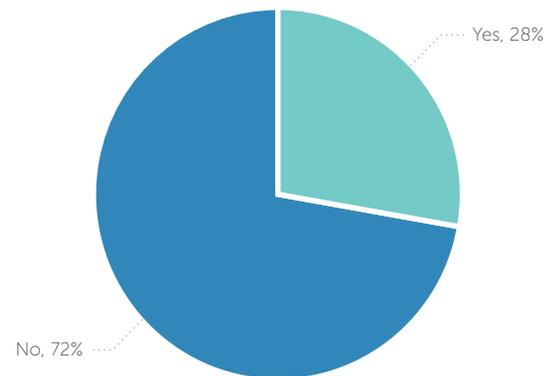


\*Figure based on research that appears in "Research Report: 2012 Storage Market Survey," November 2012, qrs.ly/hf2z6ay.

## Current usage of unified storage systems

Does your organization use unified storage systems that consolidate file-based and block-based access in a single storage platform?

(Percent of respondents, N = 418)\*



\*Figure based on research that appears in "Research Report: 2012 Storage Market Survey," November 2012, qrs.ly/hf2z6ay.



T organizations have been wrestling for years with a thorny catch-22. First they pay to power the data center. Then they pay again to dissipate the heat generated by the very same power. New environmental regulations and rising energy costs only exacerbate the problem. Today, organizations need to squeeze the utmost performance from every watt of energy their data centers use, and yet they have to do so within constrained budgets. Dell helps IT organizations meet these challenges through leading-edge research and development that enhances many Dell™ systems components to help improve power consumption, cooling, and airflow.

#### Minimized cooling requirements

The Fresh Air initiative at Dell offers a working response to energy consumption and cooling cost challenges that organizations often face for their data center operations. Modern data centers are typically run at much lower temperatures than are necessary. The Fresh Air capability for cooling servers is designed to allow organizations to minimize—or even eliminate—cooling requirements within their data centers. It enables organizations to take advantage of cool external temperatures, bypassing the need for compressor-based cooling for entire portions of the year. In some climates, the fresh air cooling helps avoid the need for compressor-based cooling altogether.

Over the last two generations, Dell systems have been developed for time-based excursion operation over a temperature range of 23 degrees Fahrenheit (°F) or minus 5 degrees Celsius (°C) to 113°F or 45°C<sup>1</sup> and allowable humidity from 5 percent to 90 percent.<sup>2</sup> This level of design robustness has been validated by tests indicating that the components can tolerate

<sup>1</sup>Advanced thermal control: Optimizing across environments and power goals," by Paul Artman and Chris E. Peterson, Dell technical white paper, February 2012, [qrs.ly/jwz280k](http://qrs.ly/jwz280k).

<sup>2</sup>"Fresh air cooling research," Enterprise Reliability Engineering presentation, April 2012, [qrs.ly/co2z7y2](http://qrs.ly/co2z7y2).

# Running data centers cost-efficiently at elevated temperatures

By Paul Steeves, Jon Fitch, and David Moss

Data center operations pose a conundrum for IT staff—incurring the cost for power and then the cost to dissipate the heat it generates. In a live demonstration, Dell advances an effective Fresh Air capability to help avoid conventional cooling costs.

up to 900 hours of 104°F—or 40°C—operation per year and up to 90 hours at 113°F—or 45°C.

Deploying Fresh Air-compliant Dell servers, network switches, or storage provides enhanced flexibility for the operational temperature in the data center, which is a best practice that helps increase energy efficiency and decrease operational costs. These tolerance levels not only help reduce everyday cooling costs, but they also offer significantly bolstered ride-through time to help protect mission-critical data in the event of a cooling system failure.

Running Fresh Air-compliant systems in a data center can result in more than US\$100,000 of operational savings per megawatt of IT equipment per year. In climates that can run chillerless cooling, the cost to build a chiller plant as part of the data center facility can be avoided, resulting in a cost savings of approximately US\$3 million per megawatt of IT equipment.

### The Fresh Air Hot House in action

Although many organizations do not intend or are hesitant to subject their production systems to the extreme limits of the tolerances specified in the Fresh Air initiative, Dell has set its sights on demonstrating this capability. IT managers and professionals can then understand that a noteworthy barrier has been crossed and discover how they can run their systems cost-effectively at high temperatures. They can also learn that running their data centers without air conditioning for an extended period of time is now possible.

Toward that end, Dell has constructed the Fresh Air Hot House, a live demonstration of its commitment to using fresh air for cooling a data center. The Fresh Air Hot House is an outbuilding—8 feet by 10 feet—situated in the parking lot at Dell headquarters in Round Rock, Texas. It has no air conditioning; fresh air simply flows from vents in the bottom up through a fan in the roof. And Texas provides an apt testing environment because brutal Texas summers can bring extreme temperatures. For example, in 2012, Round Rock experienced 70 consecutive days in which high temperatures were over 100°F—almost 38°C—including a record high of 112°F—more than 44°C.

Dell is expected to run the following three Fresh Air-certified Dell PowerEdge™ servers in the initial installation: a PowerEdge R720 server, a PowerEdge R620 server, and a PowerEdge R710 server. Fresh Air-compliant configurations are available for both PowerEdge 11th- and 12th-generation servers.

### Real-time systems management

Because not everyone can come to Texas to see the Fresh Air Hot House in action, Dell is deploying the Dell OpenManage™ systems management suite to monitor power consumption in each of its servers. Dell plans to display status on a physical monitor in the Fresh Air Hot House and on a public Web site that details how the servers are handling daily temperatures. Dell OpenManage works in conjunction with Intel® Node Manager power management firmware to closely monitor and control the thermal status and power usage of the servers and their components.

### An open window to cost-effective cooling

The Dell Fresh Air initiative opens up opportunities for IT organizations to dramatically enhance energy efficiency cost-effectively. Even organizations with conventional data centers utilizing chiller facilities can apply air-side economization, or free cooling, simply by turning off their chiller and using outside air to cool the data center. This approach helps avoid costly chiller- and compressor-based cooling when climate conditions are favorable. The number of free cooling hours that an organization can take advantage of is determined by the climate where the data center is located. It also depends on the temperature and humidity operational window, which is determined by the temperature and humidity range of the hardware inside the data center. As this window widens, increased hours of free cooling energy are available to the data center. 

### Learn more

Dell energy management:  
[dell.com/freshair](http://dell.com/freshair)



### A breath of fresh air for Dell PowerEdge servers

Discover the inspiration behind the Dell Fresh Air Hot House. View this video to hear Brian Payne, executive director, Dell PowerEdge server marketing, describe the origins of the Fresh Air capability in PowerEdge servers as he demonstrates the Fresh Air Hot House at Dell World 2012.

[qrs.ly/q52xxpf](http://qrs.ly/q52xxpf)

### Innovative data center cooling

Organizations that leverage fresh air cooling in their data centers can realize cost reductions even in their own locales rather than situating data centers in specially selected northern climates. Download this white paper to learn how Dell next-generation servers offer the Fresh Air capability for enhanced efficiency.

[qrs.ly/uz2xxpg](http://qrs.ly/uz2xxpg)

### Authors

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# Managing I/O-intensive workloads with versatile solid-state storage

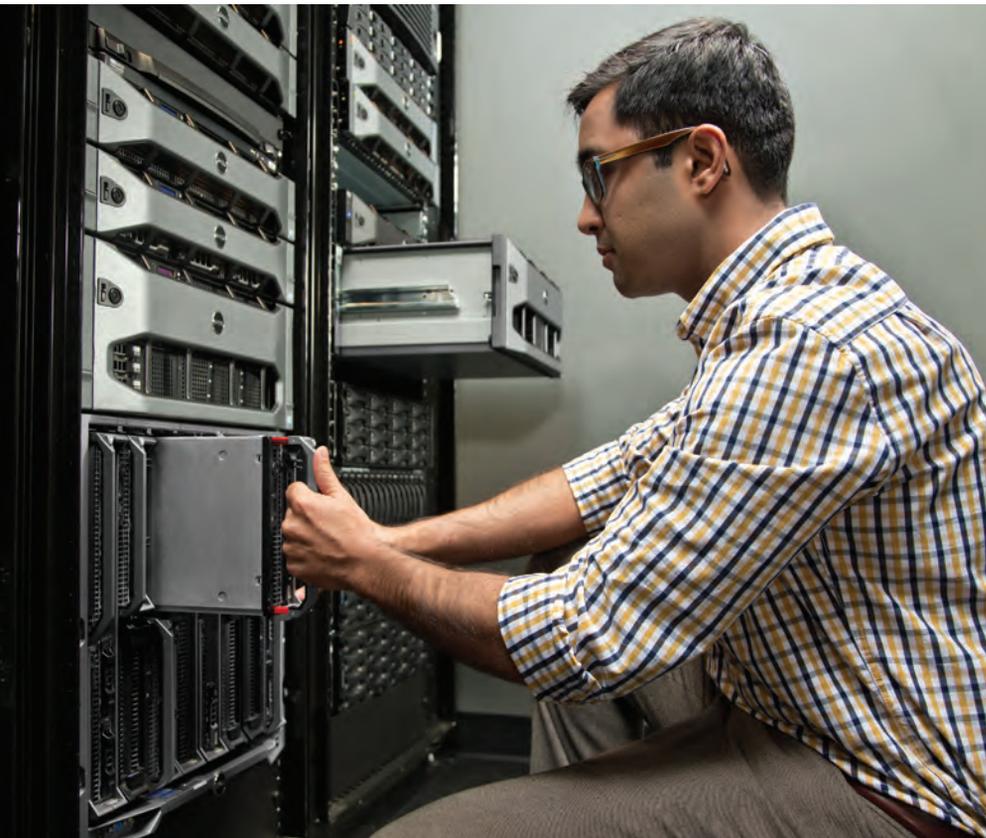
By Andy Tran

In many IT environments, swift transactions and analyzing volumes of data in real time require high performance and low latency. Dell™ PowerEdge™ Express Flash solid-state drives offer flexible, durable, and efficient storage for demanding workloads.

Collaboration, database, and other business-critical applications that process high volumes of data are creating intensifying performance demands for many enterprise IT environments. Enhanced performance can boost the efficiency of online transaction processing (OLTP), online analytical processing (OLAP), real-time application processing for data reads and writes, and other I/O-intensive applications. Heightened levels of performance can also be particularly important when deploying collaboration applications or virtual desktop infrastructure (VDI) to boost productivity. In addition, many transactional and database applications require low latency to help achieve high-availability, reliability, and serviceability goals.

Along with the deluge of data that many industries experience, performance and latency concerns are compelling organizations to advance innovation that can narrow the gap between server and storage performance. While local storage and storage interconnects have evolved considerably, mechanical movement and disk rotational speed limitations in conventional hard disk drives (HDDs) can restrict their capability to meet these high-performance demands and contribute to back-end storage bottlenecks. Solid-state storage offers an innovative, nonvolatile alternative for local storage because it utilizes integrated circuits rather than rotating magnetic media for storing data.

Devices that implement solid-state technology such as solid-state drives (SSDs) are compatible with traditional Serial Attached SCSI (SAS), Serial ATA (SATA), and Fibre



# Serviceability on the fly

A high priority for many IT organizations operating with limited budgets and time-strapped IT staff is implementing innovative, durable components that help improve the efficiency of their data centers. Like other IT innovations, Dell PowerEdge Express Flash PCI Express (PCIe) solid-state drives (SSDs) are designed to simplify installation and configuration tasks.

Hot-pluggable PowerEdge Express Flash PCIe-SSDs are a snap to install and configure, and they require no software downloads or firmware updates. Hot-pluggable capabilities help minimize the risk of downtime because administrators do not need to take a server

offline to add or remove a PowerEdge Express Flash PCIe-SSD. Instead, they simply plug the device directly into the preconfigured 2.5-inch bays in supported PowerEdge 12th-generation servers.

PowerEdge Express Flash PCIe-SSDs also leverage specialized NAND management technologies designed to provide robust lifetime wear leveling and data protection. Because NAND-based SSDs have a finite number of program and erase cycles, Dell provides for a maximum amount of data—in bytes—written to PowerEdge Express Flash PCIe-SSDs. The SSD monitors these cycles, and Dell management software notifies administrators prior to when the limits are reached.

Channel device interfaces for enhanced versatility. Recent advances allow solid-state storage devices to connect directly to server PCI Express (PCIe) slots without requiring intervening host bus adapter (HBA) connectivity or interface controllers such as SAS and SATA. Dell PowerEdge Express Flash PCIe-SSDs utilize NAND flash solid-state memory and can be directly plugged into the PCIe bus, offering organizations a cost-effective, power-efficient alternative to conventional HDD storage.

## Flexible solid-state drive performance

Dell PowerEdge Express Flash PCIe-SSDs are designed to provide flexible, high-performance storage in Dell PowerEdge 12th-generation servers. PowerEdge Express Flash PCIe-SSDs are well suited for write-intensive applications that require high write endurance and read/write performance.

Organizations can deploy PowerEdge Express Flash PCIe-SSDs either as a storage cache or as a tremendously fast storage tier for frequently accessed—or hot—data. The storage cache capability is suitable for page files or as a second-level database buffer cache. Storage tiers can be beneficial for handling high I/Os per second (IOPS), increased numbers of end users, and rapid response times, particularly in OLTP and OLAP. Fast storage tiers are also well suited for data access in virtualized environments and for collaboration applications.

PowerEdge servers equipped with both PowerEdge Express Flash PCIe-SSDs and traditional HDDs offer versatile deployments for handling specific application workloads. In a typical database application, for example, frequently accessed log files can be stored on a PowerEdge Express Flash PCIe-SSD, and data files can be stored on an HDD. PowerEdge Express Flash PCIe-SSDs, built with single-level cell (SLC) NAND flash technology, are designed to deliver enterprise-class storage reliability and serviceability in a hot-pluggable, standard 2.5-inch form factor (see the sidebar, “Serviceability on the fly”).

## Effective Smart Grid data analysis

By breaking through the I/O bottlenecks that can impact latency-sensitive applications, Dell PowerEdge Express Flash PCIe-SSDs are designed to excel in environments that require analysis of near-real-time data on the fly and with zero latency. Electric utility companies, for example, can benefit immensely by deploying servers equipped with high-performance, innovative, and durable PowerEdge Express Flash PCIe-SSDs for operating and maintaining electrical grids.

Electrical grids must remain up and running 24/7 and always energized with more power than is being consumed to prevent the occurrence of brownouts. As a consequence, a considerable amount

of power goes unconsumed because of inefficiencies around when and where it is generated. For example, power generated far from where it will be used experiences some loss during its transmission.

The emergence of Smart Grid technology applies automation to collecting data and the capability to act on the information it provides to help improve the efficiency of electricity generation and distribution. Smart Grid operators need an efficient process for identifying and assessing the health of the grid distribution system in real time. Smart Grid technologies generate tremendous amounts of real-time data operators can use to adjust power generation levels and analyze patterns of consumption. And they can use historical and archived data to predict future consumption patterns.

Dell developed the Dell Smart Grid Data Management (SGDM) solution to help utility organizations and grid operators manage Smart Grid data efficiently and address the power distribution and waste challenges of managing electrical grids. SGDM applies Dell enterprise hardware, services, and independent software vendor offerings to automate the collection and use of Smart Grid data. At the same time, collecting and storing vast amounts of Smart Grid data can pose enormous challenges. The deluge of data and information utility companies face demands immediate analysis, synthesis, and action. Failure to act fast can easily lead to

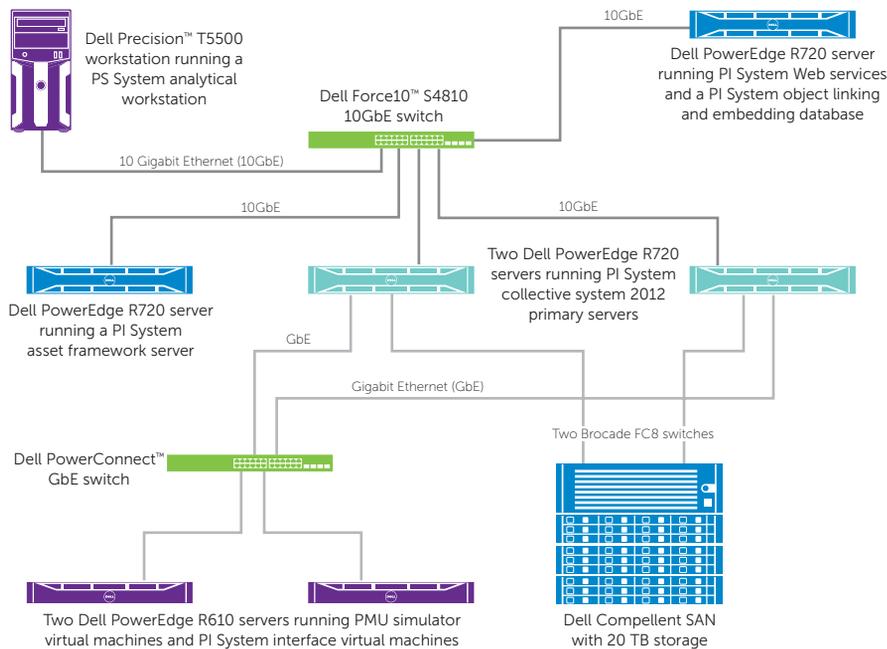


Figure 1. The Dell SGDM reference architecture

spikes or surges throughout a grid, as well as brownouts or even widespread blackouts.

SGDM provides a reference architecture that enables electrical utilities and grid operators to effectively manage grid performance (see Figure 1). Within the infrastructure, machines called Phasor Measurement Units (PMUs) generate near-real-time data that can be monitored and historical data that can be utilized to spot trends. Using this data, grid operators can make intelligent decisions about how much power to generate. These decisions include determining the right place and the right time to generate power. This PMU intelligence enhances power distribution efficiency and cost-effectively minimizes the likelihood and impact of outages.

The SGDM reference architecture consists of Dell PowerEdge 12th-generation servers, tiered storage in Dell Compellent™ storage area network (SAN) arrays, and leading-edge PI System software from OSIsoft. The PowerEdge servers were

equipped with 350 GB PowerEdge Express Flash PCIe-SSDs designed to process PMU data. Compellent storage included 200 GB Enterprise SSDs and 300 GB 15,000 rpm SAS drives for storing historical data collected within 30–60 days. And to archive up to one year of data, the Compellent storage also included low-cost 2 TB 7,200 rpm SAS drives. PI System provides a real-time, enterprise-wide infrastructure for collecting, storing, analyzing, and delivering information to worldwide grid operators. *Note:* Additional Compellent storage can be added to scale archiving up to seven years.

In September 2012, OSIsoft engineers performed benchmark testing on PI System performance for storing and handling data from PMUs within the Dell SGDM reference architecture.<sup>1</sup> Results demonstrated three key PI System performance aspects for high-speed management of high-frequency data from PMUs—write throughput, read throughput, and overall scalability. In the area of read throughput, results showed

impressive amounts of random I/O disk reads sustained by SSD technology in addition to a nominal write load. Theoretical IOPS capacity measured by Iometer resulted in noteworthy amounts of raw IOPS with relatively short I/O queues for the SSDs, which provided near-linear scalability of IOPS against queue length.

### Efficient management of high-volume data

Applications that handle dynamic, high-volume data for analysis and management require high-performance local storage with low latency. Organizations that deploy OLTP, OLAP, VDI, collaboration software, and other I/O-intensive applications are looking beyond traditional HDDs to the versatility, reliability, and serviceability SSDs can provide. Electrical utility companies and grid operators, in particular, can utilize flash technology in SSDs to enhance near-real-time data collection, storage, and analysis plus information delivery.

Dell PowerEdge Express Flash PCIe-SSDs are designed to deliver high IOPS performance and low latency that utility organizations and grid operators need for collecting, analyzing, and managing high data volumes in near real time. Dell developed the SGDM reference architecture to help these organizations meet the challenges of high-velocity power generation, consumption, and management of Smart Grid data. PowerEdge 12th-generation servers and Dell Compellent storage equipped with SSDs facilitate rapid, near-real-time data analysis to enhance power generation and distribution.

### Author

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### Learn more

Dell PowerEdge Express Flash PCIe-SSDs: [qrs.ly/3t2z7y1](http://qrs.ly/3t2z7y1)

<sup>1</sup>“PI Server 2012: Smart Grid high-speed data management on Dell reference architecture,” technical white paper, OSIsoft LLC, September 2012.



# Enhancing server performance and scalability with solid-state drives

By Steve Weinger, Marc Crespell, and Yogev Shimony

Performance and scalability are key considerations for organizational data centers that span remote or branch offices. Dell™ PowerEdge™ servers equipped with Samsung solid-state drives help advance application workload efficiency and scale for growth.

Optimizing application performance is an ongoing priority for diverse organizations of all sizes. For example, retail firms, financial institutions, manufacturers, and other organizations rely on IT to provide the resources necessary to handle heavy data volumes for online transaction processing (OLTP). At the same time, IT groups within these organizations are expected to bolster employee productivity by delivering robust system performance for messaging, document collaboration, and other business applications.

As these organizations deploy servers in remote offices and branch locations, and as they refresh their primary data centers, they need ways to deliver this strong application performance while also ensuring scalability for future growth. However, IT groups often cannot simply install additional servers to accomplish those goals. Instead, they need to look for opportunities to maximize the utilization of each server to keep costs in check.

Addressing the challenges of performance, scalability, and cost is also particularly important for IT organizations deploying a virtual desktop infrastructure (VDI). To realize the opportunities and benefits VDI offers, IT groups need to provide a responsive desktop experience for a potentially large number of end users while minimizing the cost of the host infrastructure.

Deploying Dell PowerEdge servers with Samsung enterprise multilevel cell (eMLC) SM825 solid-state drives (SSDs) helps organizations overcome these challenges. By offering high-performance local storage,



## Solid performer

Dell commissioned Principled Technologies to evaluate the capability of Dell PowerEdge 11th- and 12th-generation servers with Samsung SSDs. View this video to see a concise summary of these tests, including the scalability benefits IT organizations can gain to enhance application performance and better support end users.

[qrs.ly/6l2y7l4](https://qrs.ly/6l2y7l4)



these Samsung SSDs are designed to deliver exceptional performance for virtual desktop environments and other key business applications without requiring organizations to add servers or use expensive external storage. These Samsung SSDs also enhance scalability to help deliver strong performance to a large number of end users while simultaneously providing the opportunity to expand for future growth.

### Energy-efficient performance

Samsung eMLC SM825 SSDs, available as an option with Dell PowerEdge 11th- and 12th-generation servers, play an important role in helping deliver the performance and scalability needed for business applications and desktop virtualization environments. These Samsung SSDs are designed to perform random read/write operations substantially faster than conventional 15,000 rpm Serial Attached SCSI (SAS) hard disk drives (HDDs). As a result, the SSDs are well suited for large, write-intensive workloads in OLTP, VDI, database, and other application environments.

Because these SSDs are based on eMLC flash technology, they can also provide a significantly longer life span than many other SSDs. Samsung SM825 SSDs offer up to 100 times better write endurance than standard MLC-based drives.<sup>1</sup> These SSDs are also part of the Samsung Green Memory line of products, which help organizations conserve energy. Samsung SM825 SSDs have no moving parts; therefore, they consume significantly less energy than typical HDDs.

Samsung SSDs help provide the scalability for change and the data protection needed for critical data. Samsung SM825 SSDs are available in multiple capacities, so organizations can scale server storage to meet current and future needs. Advanced Encryption Standard (AES) 256-bit encryption

helps organizations keep data secure while power-loss protection helps strengthen reliability.

### Agile scalability for virtual desktop environments

To measure the performance and scalability of a Dell PowerEdge 12th-generation server equipped with Samsung SSDs as the foundation for a VDI implementation, Dell commissioned testing by Principled Technologies in October 2012. The goal was to evaluate whether servers equipped with SSDs help IT organizations deliver strong desktop performance and support a large number of end users on a single server. Processor, memory, and disk utilization levels were evaluated to assess the VDI hosting platform's capacity to scale.<sup>2</sup>

The test configuration included a single Dell PowerEdge R720 2U rack server powered by two 8-core Intel® Xeon® E5-2680 processors and running the Microsoft® Windows Server® 2012 Datacenter Edition 64-bit OS with the Microsoft Hyper-V® hypervisor. The server was equipped with four 300 GB 15,000 rpm SAS drives and six 200 GB Samsung SM825 SSDs. In addition to Hyper-V, the Microsoft Remote Desktop Services (RDS) server role in Windows Server 2012 was used to build the VDI

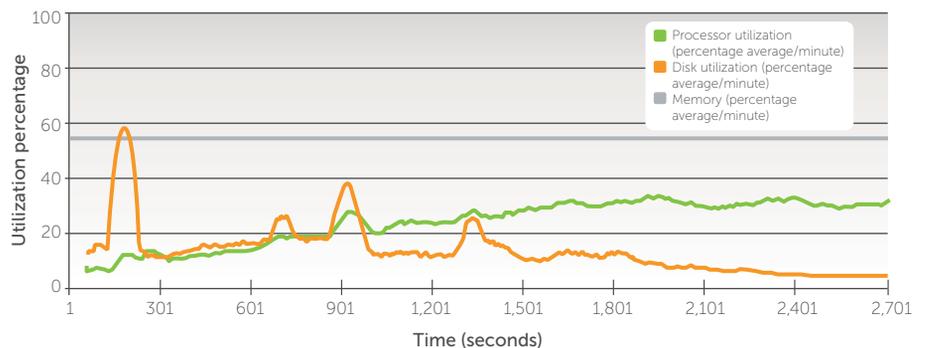
environment. The Login Consultants Virtual Session Indexer (VSI) benchmark was used to simulate typical desktop office activities—including the use of Microsoft Office, multimedia applications, and a Web browser—for 60 end users.

The PowerEdge server equipped with Samsung SSDs easily supported 60 virtualized desktops running moderate workloads and with substantial resources to spare, while helping deliver acceptable response times based on Login VSI benchmarks. Processor, memory, and storage utilization remained significantly low throughout the duration of the test (see Figure 1).<sup>3</sup>

These results suggest that a single server may be sufficient to implement a VDI solution, particularly for remote offices or small and medium businesses. By deploying multiple PowerEdge servers equipped with Samsung SM825 SSDs, larger organizations can scale these benefits, launching VDI environments while using a consolidated hardware infrastructure that conserves data center resources.

### Enhanced productivity for collaboration applications

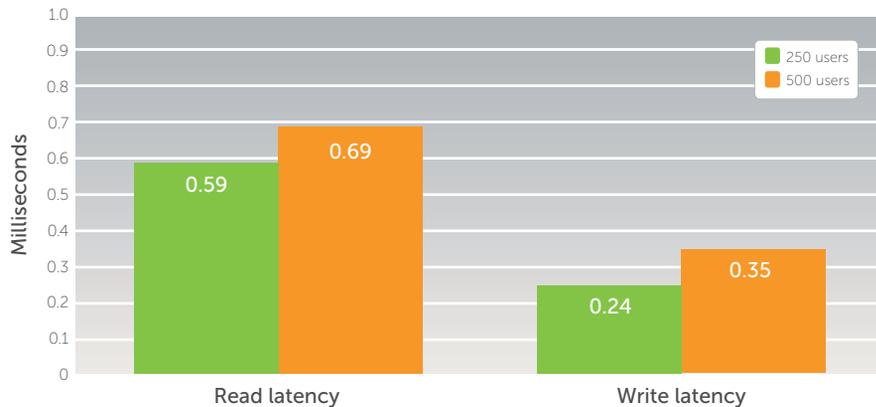
In September 2012, Dell commissioned testing by Principled Technologies to evaluate performance for three commonly



Source: "Dell PowerEdge R720 server solution with Samsung SSDs and Windows Server 2012: Supporting virtual desktops in remote offices," by Principled Technologies, commissioned by Dell Inc., October 2012.

Figure 1. Resource utilization: Supporting virtualized desktops with substantial resources to spare

<sup>1,2,3</sup> "Dell PowerEdge R720 server solution with Samsung SSDs and Windows Server 2012: Supporting virtual desktops in remote offices," by Principled Technologies, commissioned by Dell Inc., October 2012, [qrs.ly/vc2y7ks](http://qrs.ly/vc2y7ks).



Source: "Remote office server performance: Dell PowerEdge R720 server with Samsung solid-state drives and Windows Server 2012," Principled Technologies, September 2012.

**Figure 2.** Exchange Server latency: Achieving response times below industry-standard thresholds

used business applications: Microsoft Exchange Server messaging, Microsoft SharePoint® Server collaboration and documentation management, and Microsoft SQL Server® database software. The goal was to determine whether servers configured with SSDs could comfortably support a large number of users while delivering acceptable response times.<sup>4</sup>

This test configuration included two Dell PowerEdge R720 2U rack servers, each powered by two 8-core Intel Xeon E5-2680 processors and running the Microsoft Windows Server 2012 Datacenter Edition 64-bit OS with the Microsoft Hyper-V hypervisor. Each server was equipped with two 146 GB 15,000 rpm SAS drives and eight 200 GB Samsung SM825 Serial ATA (SATA) SSDs. One server ran Exchange Server 2010; the other server ran SharePoint Server 2010 and SQL Server 2012.

To evaluate the performance of these applications in a virtualized environment—an increasingly common scenario in many organizations—a distinct virtual machine hosted each of the three applications. Testing simulated first 250 and then 500 end users simultaneously using e-mail, accessing the database, and collaborating.

The test recorded end-user response times and the number of database orders per minute.

In simulations for both 250 and 500 end users, Exchange Server response times were below industry-standard thresholds for acceptable performance. For the simulation of 250 end users, read latency and write latency were well below 20 ms. Latency was only slightly higher in the simulation for 500 end users than in the scenario for 250 end users (see Figure 2).<sup>5</sup>

The SQL Server implementation demonstrated acceptable performance for orders per minute in both scenarios: 1,472 orders per minute for the simulation of 250 end users and 2,899 orders per minute for the simulation of 500 end users. Acceptable performance was defined as 90 percent of the theoretical maximums—which are 1,350 and 2,700 orders per minute, respectively—for the 250 and 500 end-user simulations. The SharePoint Server implementation supported 249 tasks per minute in the simulation for 250 end users and 496 tasks per minute in the simulation for 500 end users. Both results surpassed acceptable performance in which users might perform one task per minute.<sup>6</sup>

In all the simulations, power utilization for each server increased only slightly compared with the server's idle state, demonstrating strong energy efficiency even when handling large workloads. PowerEdge servers equipped with Samsung SSDs not only help provide outstanding performance for key business applications—they also help ensure scalability for future growth without having to deploy numerous servers or rely on external storage.

### Optimized data center performance

Organizations deploying servers in remote or branch offices, launching VDI, or refreshing data center infrastructure need innovative ways to enhance performance and scalability while controlling costs. Deploying Dell PowerEdge 11th- and 12th-generation servers equipped with Samsung SSDs enables organizations to address these needs. By selecting PowerEdge servers with Samsung SSDs, organizations can cost-effectively consolidate applications onto fewer servers while achieving the performance they need to help boost end-user productivity. **PS**

### Authors

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### Learn more

**Samsung SSDs for servers:**  
dell.com/business/ssd/server

**Samsung Green Memory and SSDs:**  
samsung.com/us/dellcio/index.html

<sup>4,5,6</sup> "Remote office server performance: Dell PowerEdge R720 server with Samsung solid-state drives and Windows Server 2012," by Principled Technologies, commissioned by Dell Inc., September 2012, [qrs.ly/ic2y710](http://qrs.ly/ic2y710).



# Advancing operational agility through converged infrastructure

By Bala Chandrasekaran and Tom Baumgartner

Convergence streamlines delivery and management of infrastructure, application workloads, virtual desktops, and IT services. Dell™ Active Infrastructure solution reference architectures offer high-performance frameworks for efficient operations.

**D**ynamic operations in today's business environments call for heightened performance, scalability, and agility in organizational data centers. The capability to support fluid processes effectively through innovation that improves efficiency, resiliency, and reliability can play a key role in helping organizations remain competitive and achieve profitability. As a result, many organizations are looking to leverage modular systems that are designed to transform data centers and streamline operations.

By converging servers, networking, storage, and unified management in innovative configurations, IT organizations can convert technology silos into highly adaptive resource pools that can be shared by applications and optimized for efficient management. Converged infrastructure also often supports cloud computing and virtualization technologies for these integrated IT resources. Modular systems offer tremendous flexibility to meet the often demanding requirements of dynamic workloads, without the complexity often inherent in customized, proprietary environments.

The Dell Active Infrastructure family of converged infrastructure solutions offers turnkey systems, such as the Dell Active System 800. This system can be set up

quickly at low total cost of ownership (TCO) from a single procurement source and with a single point of support. Central to Active System 800 is Dell Active System Manager 7.0, which provides advanced automation to help simplify administrative tasks in a converged environment.<sup>1</sup>

Active System Manager 7.0 is designed to simplify complex infrastructure and workload management activities. It automates many tasks that would otherwise be prone to error when performed manually, which helps administrators save time and reduce the risk of introducing errors. A single user interface helps simplify and automate management, enabling IT administrators to respond rapidly to business needs while increasing data center efficiency and strengthening the quality of IT service delivery. Active System Manager also streamlines activities such as discovery, inventory, deployment, configuration, and ongoing monitoring and management.

Virtualized environments help organizations deliver collaboration applications and IT services as business needs change and as employees increasingly rely on expanding access points through personal devices to enhance their productivity. And for organizations planning a private cloud environment, a converged infrastructure can replace slow and inefficient

IT systems to help reduce power and cooling costs, accelerate deployment, and deliver services that support rapidly changing business demands.

## Flexible modular infrastructure

Dell Active System 800 is an integrated and optimized modular infrastructure within the Dell Active Infrastructure family. It offers extensible hardware and software stacks and leverages converged Internet SCSI (iSCSI) storage area network (SAN) and LAN resources into a single 10 Gigabit Ethernet networking fabric that leverages the Data Center Bridging (DCB) standard. Active Infrastructure is available either as a preintegrated system or through purpose-built solution reference architectures. Preintegrated systems offer comprehensive infrastructure for quickly and easily deploying preengineered, preassembled, pretested, and optimized workloads. Solution reference architectures enable rapid integration to speed up infrastructure rollouts of consistent and highly available configurations designed for optimal performance and reliability.

These solution reference architectures facilitate efficient, rapid deployment of applications, virtual desktops, and private clouds. They offer IT organizations a range of frameworks to help them plan, architect,

<sup>1</sup> For more information on Active Infrastructure and Active System Manager, see "Optimize IT with converged infrastructure," by Brent Collins, Marc Stitt, and Benjamin A. Tao, in *Dell Power Solutions*, 2012 Issue 4, qrs.ly/t32y717, and "Accelerating data center operations," by Aaron Prince, Angela Qian, and Sudhir Shetty, in *Dell Power Solutions*, 2012 Issue 4, qrs.ly/4a2y827.

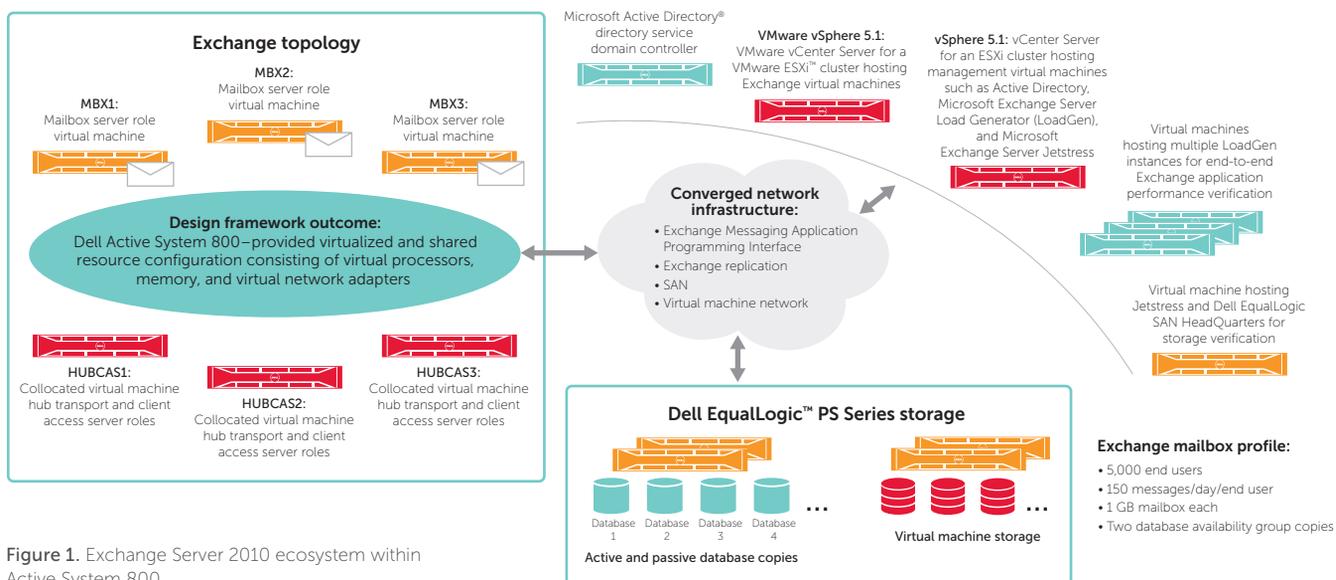


Figure 1. Exchange Server 2010 ecosystem within Active System 800

deploy, and support collaboration application, virtual desktop infrastructure (VDI), and private cloud computing deployments that can be tailored to meet specific organizational needs.

### Productivity-enhancing collaboration applications

Collaboration applications continue to transform the business landscape. Microsoft® Exchange Server messaging, Microsoft SharePoint® Server collaboration and document management, and Microsoft Lync® instant messaging applications, for example, allow organizations to put powerful tools at end users' fingertips. Increasingly, these productivity-boosting applications require IT administrators to address the challenges of deploying, maintaining, and managing suitable environments to help ensure high levels of performance, flexibility, and reliability.

These key enterprise applications can be moved onto virtualized servers to support important business drivers. However, many approaches require a dedicated set of hardware resources to help ensure performance and availability. Dedicated hardware can create resource silos for specific applications and increase IT management complexity.

Active Infrastructure solution reference architectures for collaboration applications build on application and virtualization best practices and use VMware vSphere® and VMware® vCenter™ Server virtualization capabilities. These solution reference architectures are designed to improve the ease of management of underlying hardware resources and, by utilizing virtualization, enable the coexistence of different tiers of enterprise applications on the same hardware.

In addition, solution reference architectures present rules that allow virtual machines running applications to be deployed and managed without having to tie them to individual physical servers. They require the deployment of fine-grained virtual resource management tools that enable advanced management of application resources. Resource requirements should be accurately defined and application best practices maintained while ensuring that the performance of Microsoft collaboration applications is within the thresholds specified by Microsoft. Active Infrastructure also provides dedicated storage resources for application data designed to ensure adequate and reliable storage performance to meet growing application data needs.

To help reduce dependencies on the underlying infrastructure from a sizing and deployment perspective, Dell methodology abstracts the application in the virtualized pool of resources consisting of memory, processors, and virtual network adapters. The configuration also consists of an appropriate number of virtual machines that correspond to various server roles. This derived application resource configuration helps ensure availability, enhance performance, and simplify the management of the converged infrastructure ecosystem.

Active Infrastructure solution reference architectures for collaboration applications provide frameworks for resource allocation and utilization, and they can establish proof points for collaboration application deployments. Such frameworks demonstrate best practices and configurations that can support verified performance and availability to determine steady state and failure-scenario performance characteristics. For example, engineers at Dell Global Solutions Engineering Lab conducted a study to design and verify implementation of Exchange Server 2010 in a VMware virtualized environment on Active System



800 for 5,000 end-user mailboxes (see Figure 1).<sup>2</sup> This implementation offers guidelines for supporting the flexibility necessary as application data grows, I/O loads increase, and the workforce expands.

### Accelerated virtual desktop deployment

End users today demand enhanced flexibility at their jobs. They are bringing laptops, tablets, smartphones, and other thin clients to the workplace in rising numbers. Virtualization provides a foundation for streamlining administrative and management tasks for end users' desktops, no matter which device they use. In turn, VDI facilitates rapidly adding, removing, upgrading, and patching applications, as well as centralizing management to support efficient and rapid security and data backup applications.

Through the centralized management of virtualized desktops in VDI, systems, applications, and data are available to authorized users regardless of the hardware capabilities of the remote device. Mobile and remote access to these mission-critical enterprise applications and data enhances worker productivity and business agility. Dell provides a reference architecture for VDI that helps IT administrators understand the design elements and hardware and software components as well as the overall architecture of the solution.

Dell DVS Enterprise – Active System 800 is designed and prevalidated by Dell Desktop Virtualization Solutions (DVS) Engineering for desktop virtualization. While its modular design facilitates a quick and easy installation, it also can be configured to meet individual business needs for swift integration into the data center infrastructure.

For organizations planning to implement VDI, Dell Active Infrastructure combined with VMware vSphere provides an end-to-end network architecture. This networking design

helps reduce complexity and cost, while expanding the flexibility of the infrastructure.

### Cost-effective private cloud computing

A private cloud creates a layer of abstraction over pooled resources that can transform capabilities for delivering and using IT services. The private cloud model provides much of the efficiency and agility of cloud computing along with the increased control and customization achieved through dedicated private resources. For organizations considering moving to a private cloud environment, Dell Active Infrastructure can be deployed as a flexible infrastructure foundation and coupled with cloud automation software for prompt and easy deployment.

Dell offers a private cloud solution based on Active Infrastructure and the Microsoft Private Cloud Fast Track Program that provides a reference architecture for building private clouds customized to the specific business needs of an organization. The reference architecture combines Microsoft software, consolidated guidance, and verified configurations with Active Infrastructure, and is designed to provide an overview of Dell and Microsoft guiding principles and design criteria for this solution. In addition, it illustrates how a private cloud can conform to these principles.

### Converged IT initiatives for agile data centers

Business priorities constantly shift. IT performance and service delivery need to keep up with new requirements and increasing demands. A turnkey approach to preconfigured, converged infrastructure helps improve performance and flexibility to meet these demands while minimizing infrastructure TCO. In addition, local control over data and operations allows IT organizations to dynamically pool, allocate, and manage resources and deploy key applications and services delivery rapidly and consistently.

The Dell Active Infrastructure family leverages Dell's extensive enterprise experience, knowledge, and relationships with virtualization providers in preintegrated, packaged approaches to converged infrastructure that deploy rapidly and efficiently. They also facilitate collapsing and automating key administrative and maintenance tasks that help free up IT staff for strategic projects that foster business growth.

The range of Dell-provided solution reference architectures utilizes the Dell Active System 800 infrastructure to provide comprehensive, balanced frameworks for collaboration applications, VDI, and private cloud services. Organizations can integrate converged infrastructure with existing resources to meet specific business needs without the cost and complexity often required in custom integration projects. **PS**

### Dive deeper

The Dell Active Infrastructure family helps IT organizations rapidly respond to dynamic business demands, maximize data center efficiency, and strengthen quality of IT service delivery. Download a series of white papers that provide frameworks and best practices for designing and implementing productivity-enhancing Microsoft collaboration applications on Active Infrastructure solutions.

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### Authors

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### Learn more

**Dell converged infrastructure:**  
[dell.com/convergence](http://dell.com/convergence)

**Dell active solution architectures:**  
[dell.com/activesolutions](http://dell.com/activesolutions)

<sup>2</sup> Based on tests performed in December 2012 by Dell engineers at Dell Global Solutions Engineering Lab. For test configuration, methodology, and results information, see "Microsoft Exchange Server 2010 implementation on Dell Active System 800v: A design and implementation guide for Exchange Server 2010 on Active System 800 with VMware vSphere," Dell Global Solutions Engineering, 2012, [qrs.ly/z82y828](http://qrs.ly/z82y828).

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# Capitalizing on the cloud

By Janet Bartleson

IT decision makers can talk to solution experts and test-drive cloud computing and big data technology through the Dell | Intel Cloud Acceleration Program—which offers hands-on or remote access to dedicated labs and state-of-the-art infrastructure.



Two hot topics in computing today are cloud and big data—and for good reason. Around the world, decision makers are dealing with rising IT costs and an onslaught of data. To address overarching challenges—from deploying on-demand, instantly scalable compute resources to gaining big insights for a competitive advantage—business and technology leaders are looking to cloud-scale solutions for help. But how can they determine the best way to capitalize on an investment in cloud computing and big data initiatives?

Dell has teamed with Intel to offer the Dell | Intel Cloud Acceleration Program, which gives IT decision makers a firsthand opportunity to see and test cloud and big data solutions—leading to a deep understanding of what these solutions can do. (For more information, see the sidebar, “Discover the difference inside.”) The program helps accelerate the path to the cloud by providing hands-on, leading-edge technology for demos and proofs of concept.

## Test before investing

Through the Dell | Intel Cloud Acceleration Program, IT decision makers can experience several next-generation cloud and big data solutions in Dell Solution Centers around the world:



## Building a data center, in minutes

The Dell Solution Center in Austin, Texas, is home to one of the most efficient data centers in the world. Through time-lapse video, view how the Dell Data Center Solutions group built this Dell Modular Data Center in record time for the Dell | Intel Cloud Acceleration program.

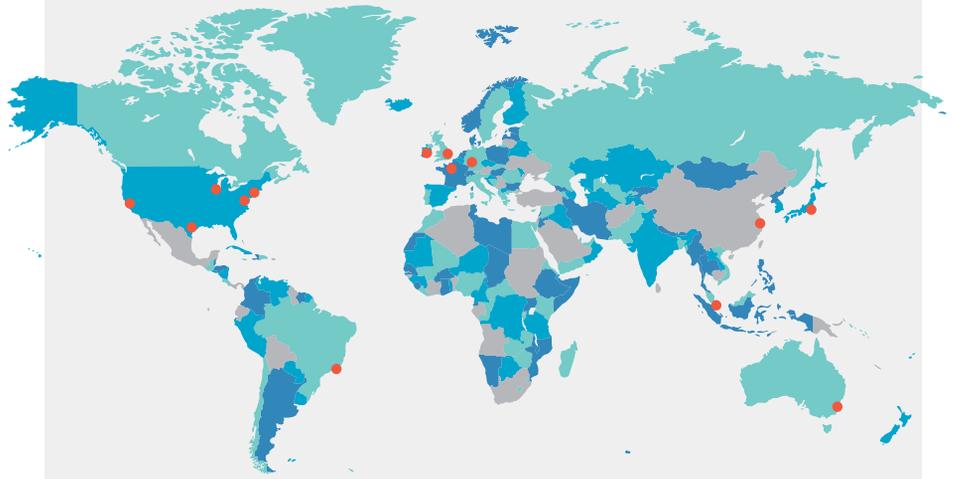
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## Remote control

Experience an online demonstration at the Dell Demo Center. The Demo Center provides anywhere, anytime access to a suite of hosted demos on a range of products, including Dell EqualLogic™ and Dell Compellent™ storage, the Dell Management Console, and the Dell Advanced Infrastructure Manager. Contact Dell for more information.

- Stand up a Dell™ OpenStack™ cloud in hours instead of days with the Dell OpenStack-Powered Cloud Solution
- Leverage the Dell | Cloudera solution to process massive amounts of diverse data types
- Avoid the guesswork in building and running efficient public and private clouds with the turnkey Dell Cloud Solution for Web Applications

Participants get an up-close look at how these solutions can quickly and easily launch cloud services—and help turn massive amounts of data into a competitive advantage. They have the opportunity to experience how applications work with the solutions before investing and determine potential time and money savings enabled by Dell cloud and big data solutions.



## Dell Solution Center locator

Explore a wide range of emerging technology alternatives and carry out industry-specific proofs of concept on-site at a regional Dell Solution Center or remotely through secure virtual private network (VPN) access.

### Americas:

- Austin, Texas, United States
- Chicago, Illinois, United States
- New York, New York, United States
- Silicon Valley, California, United States
- Washington, D.C., United States
- São Paulo, Brazil

### Europe:

- Bracknell, United Kingdom
- Frankfurt, Germany
- Limerick, Ireland
- Paris, France

### Asia and the Pacific:

- Shanghai, China
- Singapore
- Sydney, Australia
- Tokyo, Japan

New Dell Solution Centers are opening on a regular basis. For more information, visit [dell.com/solutioncenter](http://dell.com/solutioncenter).

## Discover the difference inside

In Dell Solution Centers worldwide, IT decision makers can evaluate the Dell OpenStack-Powered Cloud Solution, the Dell | Cloudera solution, or the Dell Cloud Solution for Web Applications as part of the Dell | Intel Cloud Acceleration Program. The centers provide a close-up view of the breakthrough performance of Dell PowerEdge™ C Series servers powered by Intel® processors, which form the heart of the demonstration clusters.

PowerEdge C Series servers with Intel processors are designed to surmount scale-out data center challenges with problem-solving innovation, streamlined feature sets, and extensively field-tested performance and efficiency. These servers are tailored to the needs of cloud builders, high-performance computing clusters, telecommunications companies, hosters, content delivery networks, and organizations running Web 2.0 and big data applications.





## Explore Dell Solution Centers in action



IT leaders from many industries have taken advantage of the opportunity to get into the driver's seat at a Dell Solution Center. With the help of solution experts, decision makers can effectively evaluate and optimize architectures on Dell infrastructure before moving to a production, internal, or cloud environment.

Menzies Aviation leveraged the capabilities of the Dell Solution Center in Limerick, Ireland, for a two-week proof of concept on a virtualized environment replicated over two data centers with failover capabilities.

"I asked our Dell account team to work with us to put theory into practice," says Justin Apps, global lead systems architect at Menzies Aviation. "It was a first for all of us. Working with the Dell Consulting team to prove that our vision could succeed was the key to the whole project." After the proof of concept, Menzies and Dell deployed identical Dell-based infrastructures at two Menzies locations in the United Kingdom, which enabled the company to protect business continuity through mirrored, virtualized environments.

Tiger Brands, the largest food manufacturer in South Africa, needed a single platform to support the company's multinational approach and improve visibility across the organization. The company also wanted to enhance system uptime and guarantee services by moving from an environment focused on disaster recovery to a high-availability environment.

Tiger Brands worked with Dell to create a test environment at the Dell Solution Center in Limerick that included Dell PowerEdge servers powered by Intel processors. "We didn't know how our platform might scale, and we wanted to measure performance against known benchmarks," says Rajesh Sewraj, CTO at Tiger Brands. "So we went to Limerick to run our own data and see how the solution would perform compared to our existing system."

Darryl Thwaites, CIO at Tiger Brands, says, "We were extremely satisfied with the results. In real-world tests, this configuration nearly always matched or substantially beat the competition—always using nonproprietary, standards-based technology."



### Fast-track proof-of-concept demonstrations

IT decision makers can test-drive cloud and big data solutions at Dell Solution Centers in more than a dozen cities around the world. (See the sidebar, "Dell Solution Center locator.") This network of technical centers provides access to Dell technology in dedicated, hands-on environments equipped with state-of-the-art labs. Participants can also experiment with cutting-edge Intel compute, storage, and networking technologies.

The centers are staffed by teams of solution experts, who have worked with thousands of organizations to help accelerate their journey to the cloud through proof-of-concept engagements, architectural design sessions, and technical briefings. (See the sidebar, "Explore Dell Solution Centers in action," for more information on how several organizations have utilized the centers.)

Dell helps organizations schedule blocks of time—up to two weeks long—on large-scale clusters for a demonstration or proof of concept. Whether in person or remotely through secure virtual private network (VPN) access, participants can talk with solution architects, see the technologies in action, and obtain direct knowledge of Dell solutions. This experience is designed to help inform purchase and implementation decisions, enabling organizations to zero in on solutions that meet their specific needs. **PS**

### Author

**Janet Bartleson** is a director in Dell Enterprise Solutions, a group that designs servers, solutions, and services for hyperscale environments.

### Learn more

**Dell OpenStack-Powered Cloud Solution:**  
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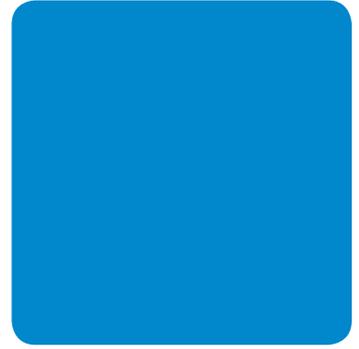
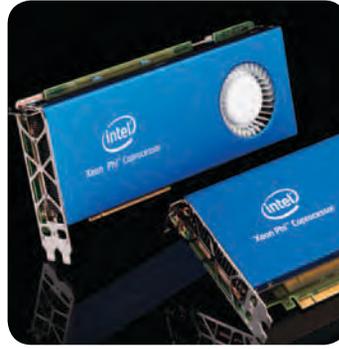
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**Dell PowerEdge C series:**  
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# Dell PowerEdge C8000 series



## Flexible, powerful, and efficient

Constantly changing workloads demand the right mix of resources, with the maximum performance per unit of rack space. The Dell™ PowerEdge™ C8000 is the first and only 4U shared infrastructure that allows the mixing and matching of compute, coprocessor, and storage sleds in one chassis—enabling organizations to easily reconfigure, refresh, and scale out as needed. The PowerEdge C8000 series is well suited for high-performance computing, big data, and hosting workloads.

### Mix-and-match design

The PowerEdge C8000 chassis packs up to eight PowerEdge C8220 single-wide compute, four PowerEdge C8220X double-wide compute coprocessor, or four PowerEdge C8000XD double-wide storage sleds in any combination for high server and storage density.

### Outstanding performance

Compute sleds are powered by the Intel® Xeon® processor E5-2600 product family, which helps boost server performance up to 80 percent over previous-generation processors.

### Reduced total cost of ownership

Compute, compute coprocessor, and storage sleds share chassis, power, and cooling, helping save on the total cost of ownership.



**Quick resource locator**  
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## Software-defined networking for the Virtual Era

By Arpit Joshipura

Server and desktop virtualization, as well as rising mobility and data volumes, is changing the enterprise networking landscape. The Dell™ Virtual Network Architecture (VNA) is an efficient, scalable framework designed to support virtual environments.

### High-performance enterprise networking

Dell has unified its networking offerings with the Virtual Network Architecture framework for efficient IT and workload intelligence. Discover the wide range of capabilities provided by the comprehensive Dell networking portfolio to suit diverse server and workload deployments.

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The Virtual Era has brought about a computing landscape of virtualized, cloud, and converged infrastructures that help boost operational efficiency and streamline IT environments for many organizations. A hallmark of the Virtual Era is real-time information exchange, which presents challenges for organizations trying to meet the access demands of an increasingly mobile workforce.

The need for real-time information, combined with rapid data growth, is dramatically changing the volume, nature, and predictability

of network traffic patterns—requiring organizations to rethink their approach to networking. At the same time, organizations face aggressive efficiency initiatives aimed at reining in power, space, and computing costs.

While infrastructure components such as servers have become virtualized and automated, traditional networking solutions are built using legacy equipment and methodologies that are often ill-suited to meet the networking requirements of modern data centers and enterprises. Legacy network infrastructures may lack the flexibility

## Dive deeper

Open innovation in the server and software industries has led to tremendous technological progress through the Internet and into the cloud. Learn how the Dell Virtual Network Architecture framework helps bring networking into the Virtual Era.

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needed to efficiently and cost-effectively handle the volume and dynamism of Virtual Era workloads, and are typically not designed to handle the high levels of automation and application integration required of a virtualized environment.

Public and private cloud infrastructures, for example, generate different traffic patterns than traditional client-server architectures. Furthermore, desktop virtualization, combined with bring-your-own-device (BYOD) initiatives, can significantly increase the volume and unpredictability of network traffic and policies. The bandwidth requirements to handle expected data growth may be a burden on the networking infrastructure that cannot be handled solely by moving to higher network speeds.

### Virtualization for intelligent networking

In response to these trends, many networking vendors are seeking to apply technologies that have driven tremendous advances in server efficiencies—such as virtualization and open, standards-based interfaces—to the networking realm. Simultaneously, convergence is bringing traditional networking functionality into data center elements such as servers. These advances, combined with existing server-based virtualization initiatives, have the potential to deliver tremendous flexibility, scalability, and efficiency to the modern data center.

As a result, many organizations are starting to view networking not as an independently purchased external resource but as an integral component of a virtualized, converged infrastructure.

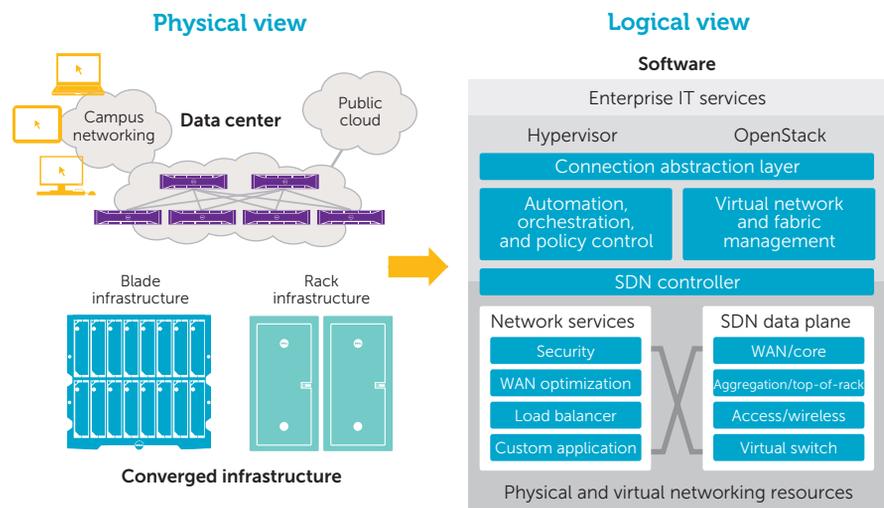


Figure 1. Physical and logical views of the Dell Virtual Network Architecture

A converged infrastructure can encompass key elements—networking, servers, storage, software, and services—into a single, conceptual whole that is powered by software and is not constrained by legacy technology. Network virtualization—that is, abstracting network functionality from the underlying physical resources and making it available programmatically through software automation—is essential to driving great flexibility and agility in converged infrastructures.

### Open, flexible framework

To help organizations meet the dynamic network requirements of the Virtual Era, Dell has developed an innovative, workload-centric approach to networking called the Dell Virtual Network Architecture (VNA). VNA enables organizations to retain existing network technology while introducing next-generation innovations (see Figure 1).

For example, as legacy network vendors make network functionality available through application programming interfaces (APIs), VNA elements can be programmatically integrated with them. VNA is also designed to be hypervisor neutral—so organizations can leverage hypervisor-based network optimization technologies in concert with

external networking functionality. VNA incorporates the OpenFlow protocol for networking as well, enabling organizations to pursue advanced software-enabled automation and integrate with emerging OpenFlow-based technology.

VNA features robust workload intelligence that enables networks to dynamically and rapidly respond to changes in workload demands. Embedded intelligence and easy-to-use software tools allow organizations to virtualize, automate, and orchestrate networking functions and services. VNA also helps optimize price, power, and space efficiency. Elements are designed for minimal power consumption and data center footprints to boost energy and space efficiency. Discrete, scalable elements enable organizations to buy only what they need and scale to meet demand.

VNA is engineered to integrate key concepts of software-defined networking (SDN), a method of network development that enables advanced network virtualization. By helping provide networks with real-time intelligence, deep application integration, and high levels of automation, SDN has the potential to help enterprises achieve high levels of IT agility while minimizing both capital and operational overhead.



# Foundational element for enterprise networks

Trends such as cloud computing, server and desktop virtualization, convergence, and workforce mobility are placing resource and management demands that legacy networks are often hard-pressed to handle. To help organizations meet dynamic Virtual Era network requirements, the Dell Virtual Network Architecture (VNA) provides an open and flexible networking framework for efficient IT infrastructure and workload intelligence. VNA is designed to be both innovative and practical:

- **Architected for the software-defined Virtual Era:** Enables flexibility and agility through software automation, network virtualization, and intelligent management.
- **Interoperable with legacy networks:** Helps organizations retain the value of existing investments while embracing advanced technology.
- **Based on leading-edge innovation:** Incorporates technology such as the OpenFlow network protocol and other emerging, open standards.

VNA provides a networking foundation that powers demanding organizations worldwide, enabling them to optimize cloud computing for enterprise workloads.

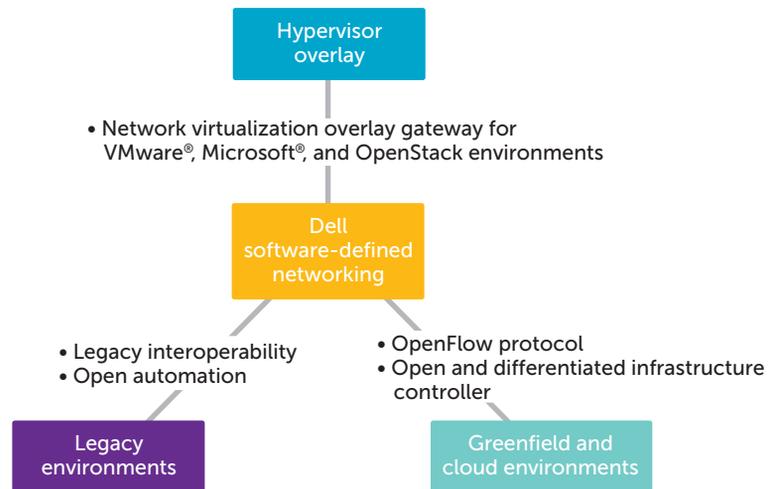


Figure 2. An innovative, open approach toward software-defined networking

VNA is designed to provide cutting-edge capabilities by taking architectural innovations from the latest SDN applications and delivering them across trusted platforms and technologies. Specifically, VNA provides an open, standards-based framework for SDN that enables interoperability with legacy systems, overlay networks, and greenfield and cloud environments (see Figure 2).

### From campus to cloud

The Dell VNA portfolio comprises both products designed to support campus, branch, and mobile networking needs and robust, scalable data center fabrics, switches, and services (see Figure 3). The portfolio spans the enterprise to deliver comprehensive, scalable, end-to-end networking.

At the workgroup, branch, and campus levels, for example, Dell campus switches deliver plug-and-play ease of use combined with minimal total cost of ownership (TCO) relative to a traditional network stack. Dell campus switches can be easily combined and scaled to support end-user communities ranging from tens of users to thousands in campus LAN environments. Dell campus wireless access points and controllers extend the enterprise network beyond the data center and into distributed

enterprise and branch environments, enabling secure productivity and mobility.

At the data center level, VNA components such as Dell data center switches deliver efficient, scalable, and intelligent networking designed to support enterprises of all sizes. Dell data center switches are available as an embedded component of a converged infrastructure system or as discrete components for cost-effective scalability. For example, Dell data center networking technology is available fully embedded in a Dell PowerEdge™ M1000e chassis for a converged, data-center-in-a-box solution that delivers plug-and-play operation with no external network—well suited for small-scale deployments. Embedding networking functionality into the blade chassis avoids the need for a top-of-rack switch; east-west network traffic is switched locally. Dell data center switches also can be deployed as discrete components in blade and rack environments of data centers to deliver enterprise-wide scalability.

Dell data center switches leverage distributed core fabric technology to deliver extremely high-density networking in a much smaller form factor than a traditional network chassis—leading to outstanding efficiencies in power, space, and cost.

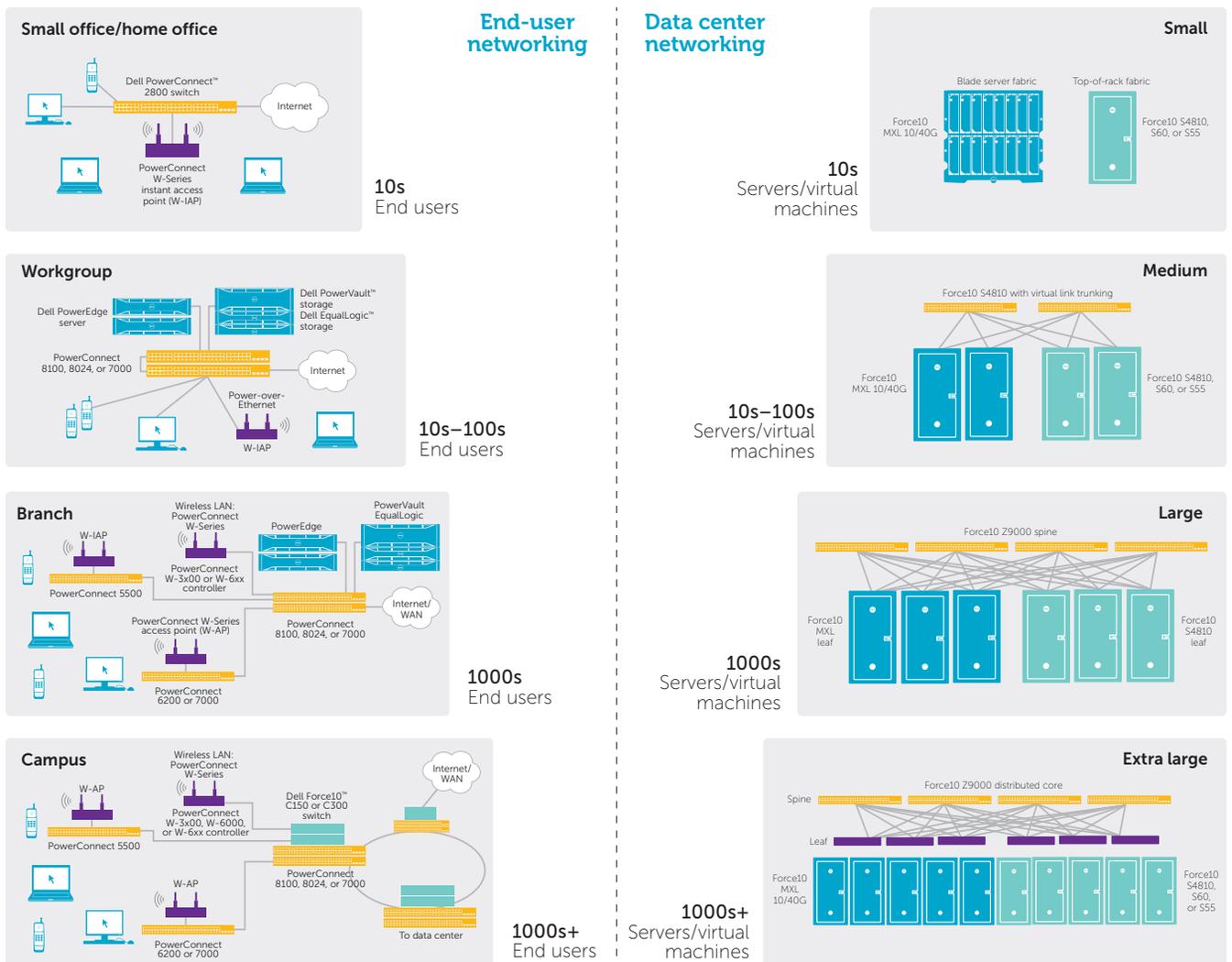


Figure 3. VNA reference architectures that scale to fit business requirements

VNA components are easily managed and automated with a range of management and software automation tools such as Dell OpenManage™ Network Manager and Dell Fabric Manager.

### Blueprint for the Virtual Era

The prevalence of virtualized, cloud, and converged infrastructures—combined with rising data volumes and the use of mobile endpoints—means that there is more reliance on the enterprise network than ever before. Dell VNA helps organizations reduce the strain on the network while maximizing the efficiency of the virtual infrastructure. VNA brings intelligent

management and automation to the data center, branch, and campus environments by enabling dynamic control of virtual servers, desktops, and office software. (For more information, see the sidebar, “Foundational element for enterprise networks.”)

Moreover, VNA is designed to virtualize, automate, and orchestrate network services to adapt to changing business conditions. VNA components integrate with other Dell enterprise solutions—including servers, storage, converged systems, software, and services—to work better together by design, enabling organizations to improve IT efficiencies and economics. **PS**

### Author

**Arpit Joshipura** is the vice president of product management and marketing for Dell Networking. Previously, he served as the chief marketing officer for Force10 Networks.

### Learn more

**Dell Virtual Network Architecture:**  
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# Laying the foundation for secure application delivery

By Fred Johnson and Andrew Walker

Application delivery to any device anywhere amid rising vulnerabilities is forever changing the IT landscape. F5 Networks offers a holistic platform of strategic awareness points for connecting end users to optimized resources on Dell™ infrastructure.

**M**obility, social networking, and other progressive technologies swell the rising tide of personal laptops, tablets, and smartphones that employees bring to the workplace. Embracing personal mobile devices in professional settings can bring significant productivity and flexibility benefits for organizations. It also means that workers now have tremendous influence over which devices and personal and professional applications exist in the organizational infrastructure. This development is driving enterprises to manage more endpoints, delivery models, and applications across more locations than ever before.

The shift to a bring-your-own-device (BYOD) policy creates new management, security, and application delivery challenges that intensify IT requirements to deliver application data securely to mobile end users. In addition, substantial changes are occurring in many data centers. IT organizations are transforming application infrastructures from static, less-efficient entities encumbered with manual processes to highly consolidated, dynamic, and automated environments. Traditional data center boundaries are blurring as administrators move workloads from one physical location to another based on business demand. Meanwhile, innovative cloud computing and software-as-a-service (SaaS) applications are coming under IT organizational

control, enabling important opportunities to simplify end-user management, enhance application performance, and increase availability.

At the same time, the ever-present threat landscape—which is exacerbated by mobility and further complicated by the cloud—is rapidly changing in ways that were unimaginable just a few years ago. Enterprise computing relies heavily on Internet technologies that routinely interact with social media, advertisement sites, and other sources that may beckon trust vulnerabilities. Web sites that employees visit can be complex systems built on myriad development frameworks and interconnections. These systems can be difficult to track and update when attempting to mitigate vulnerabilities, stop unauthorized access, and protect end-user devices against malicious attacks.

Traditional application management solutions may perform poorly with today's complex application delivery models. Standard firewalls and simple application delivery controllers (ADCs) may no longer solve problems for IT administrators or providers who need to apply advanced security, performance, and availability policies for applications inside and outside the data center. To help address the changes affecting IT organizations, an advanced, highly sophisticated model is required.

F5 Networks offers a comprehensive platform that utilizes strategic awareness of applications, end users, and resources to help IT organizations



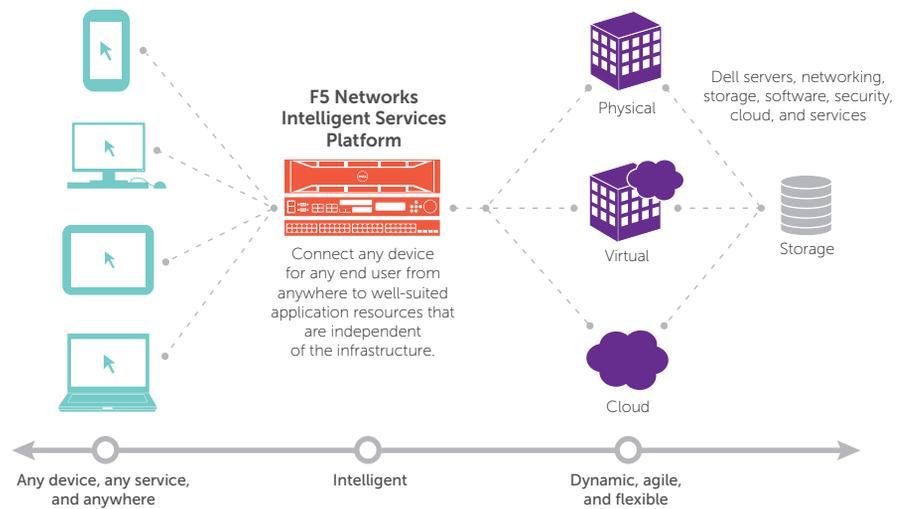


Figure 1. F5 Intelligent Services Platform capabilities running on integrated Dell infrastructure



optimize application delivery in today's dynamic business environments. The F5® Intelligent Services Platform solution is designed to seamlessly integrate infrastructure including the comprehensive portfolio of Dell servers, networking, storage, software, security, and services for connecting mobile end-user devices to highly dynamic, agile, and adaptive resources.

### Managing end users and devices from anywhere

The F5 Intelligent Services Platform controls application delivery in the evolving world of on-premises and off-premises applications accessed by multiple end-user devices (see Figure 1). The platform is designed to manage end users from any location on any device, apply application delivery policies to all application requests in both directions, and connect end users to optimized application resources regardless of where those resources reside.

Dell and F5 work closely together to offer a comprehensive ecosystem for enterprise software provided by vendors including Citrix, Microsoft, Oracle, SAP, SunGard, and VMware that help organizations meet their business needs. The highly flexible Intelligent Services Platform—available as hardware

or software—deploys F5 virtual Clustered Multiprocessing™ (vCMP®) technology to support virtualized instances of the F5 BIG-IP® suite running on purpose-built hardware. The software-only version, BIG-IP Virtual Edition, facilitates running add-on software modules on virtual appliances and supports flexible licensing models, many widely used hypervisors, and the Dell vCloud® public cloud solution.

As application, end-user computing, data center management, security, and other IT landscapes continue to evolve, the F5 Intelligent Services Platform offers robust F5 support and technology. Offerings include an extensive community of developers, application programming interfaces (APIs), scripting languages, and templates that help deliver programmability, unified services, and application fluency and scale (see Figure 2). They also enable IT organizations to meet dynamic business needs efficiently. The platform's programmability stack includes the following resources and components:

- **Community:** The F5 DevCentral™ online community includes more than 100,000 registered users and developers across 191 countries. The site provides a rich resource dedicated to publishing, sharing,

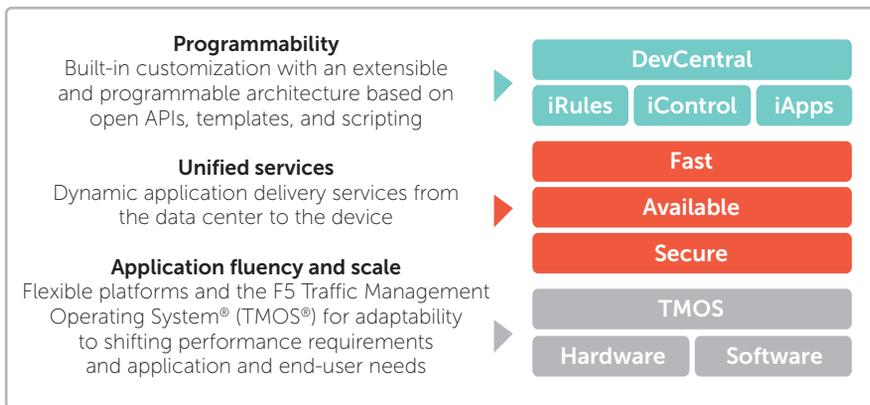


Figure 2. Unified ADC services platform enabling programmatic extensibility, services, and performance

and engaging in real-time application delivery solutions.

- **APIs:** The F5 iControl® API offers an open Simple Object Access Protocol (SOAP) and XML-based interface that enables applications to work in concert with the underlying network based on software integration.
- **Scripting:** The F5 iRules® scripting language utilizes an easy-to-learn Tool Command Language (TCL) scripting syntax and enables customization to intercept, inspect, transform, and direct application traffic on the data plane.
- **Templates:** Customizable F5 iApps™ configuration templates help administrators significantly reduce deployment times, complexity, and errors during application implementations.

A proxy turns a two-party session into a four-party session, and the two parties in the middle emulate the two real hosts. The integrated application, end-user, and resource awareness capabilities come together at this point to provide application delivery awareness at the strategic point of control. The F5 full-proxy architecture comprises the following strategic awareness control points on the integrated Intelligent Services Platform:

- **Application awareness:** Insight into how the application is supposed to look on the network
- **User awareness:** Ability to see which end users are trying to access which applications from which devices
- **Resource awareness:** Integration of all pieces in the application delivery

### Implementing strategic awareness control points

The F5 BIG-IP platform functions as a full proxy that maintains two separate pieces of data for every session between a client and an application—one on the client side and one on the server side. This functionality effectively provides an *air gap* or isolation layer between the two sides that is internal to the proxy (see Figure 3). This separation enables administrators to apply focused profiles specifically to address problems that are unique to each side of the traffic flow or conversation.

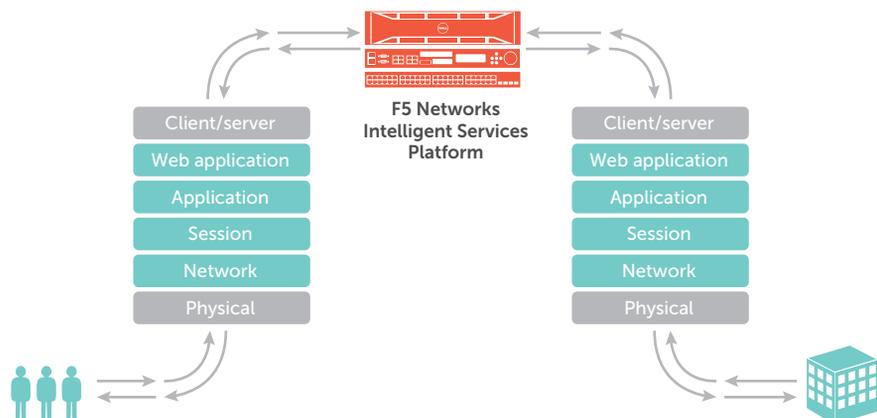


Figure 3. Full-proxy architecture providing an isolation layer

infrastructure to provide real-time visibility into the entire application delivery network

An F5 core strategy builds on the belief that well-suited mobile device management and application management occur simultaneously by deploying an integrated F5 Intelligent Services Platform that acts as a full proxy between end users and applications.

### Leveraging consolidated firewall services

The increasing sophistication, frequency, and diversity of cyberattacks today can potentially overwhelm conventional, stateful security for devices at the edge of the data center. Because their inability to detect and survive complex attacks often leads to business disruption, these systems can pose a significant liability. Hackers are aware of these weaknesses, and modern attacks are designed to exploit them.

Traditionally, administrators have deployed separate point solutions intended to mitigate these wide-ranging threats by using specific approaches to address each attack type divided into logical groupings—for example, network, application, and distributed denial-of-service (DDoS) attacks. These disconnected approaches, often from multiple vendors, tend to increase overall management complexity and costs while adversely impacting performance and end-user experience.

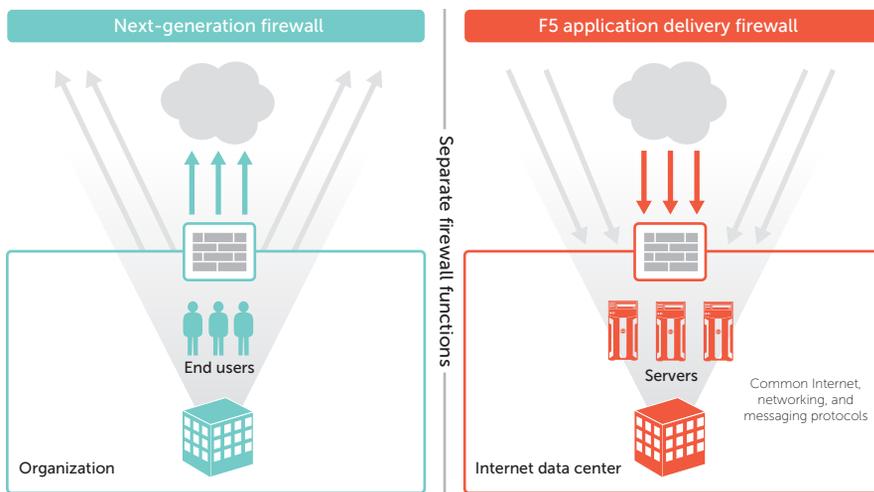


Figure 4. Application delivery firewall for protecting applications in an Internet data center

In contrast, the F5 approach to the firewall problem leverages F5 Intelligent Services Platform capabilities by unifying security and traffic management services into a single set of ADCs that administrators can place at the edge of the data center (see Figure 4). A recent data center architecture based on the ICSCA Labs–certified application delivery firewall services<sup>1</sup> of the F5 BIG-IP Local Traffic Manager™ (LTM®) ADC is designed to effectively fend off advanced attacks. At the same time, it helps improve efficiencies gained from using the highly consolidated system. BIG-IP LTM enables this architecture through its native firewall services, which can provide network-layer protection with a much higher connection capacity than traditional firewalls.<sup>2</sup>

An approach using F5 technologies is designed to consolidate security services for an outstanding defense against attack types that threaten networks, sessions, and applications. Having fewer high-capacity devices than in conventional firewall deployments helps reduce complexity, minimize attack surfaces, and decrease the number of configurations to manage

during an attack. As a result, IT staff can concentrate their defenses at the F5 single point of control.

### Deploying holistic, scalable application delivery

The F5 Intelligent Services Platform provides a foundation for delivering holistic and scalable application systems that are designed to enable IT administrators to meet the many challenges posed by deploying innovative technologies in today's data centers. Based on the F5 BIG-IP ADC full-proxy architecture, this highly scalable, application-fluent, and extensible approach helps maximize and simplify management as it integrates leading-edge application delivery, monitoring, and context-based policy enforcement.

The comprehensive Dell portfolio of end-to-end infrastructure offerings—from servers, networking, and storage to software, security, and services—integrates with the Intelligent Services Platform. This comprehensive approach to application delivery helps organizations intelligently manage application traffic and protect key resources inside and outside of the data center. **PS**

### Authors

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<sup>1</sup> For more information on ICSCA Labs, visit [icsalabs.com](http://icsalabs.com).

<sup>2</sup> For more information on managed Web application firewall (WAF) security services for the BIG-IP platform, see "Rock-solid protection for Web application delivery," by Fred Johnson, Allen Vance, and Andrew Walker, in *Dell Power Solutions*, 2012 Issue 3, [bit.ly/Rltz5M](https://bit.ly/Rltz5M).



# Deploying a virtual distributed switch to centralize network management

By Brian Johnson

Legacy networks and inflexible resource allocation hinder large-scale virtualization. Pairing the VMware vSphere® Distributed Switch feature with Intel® Virtualization Technology for Connectivity optimizes management of storage and virtual networks.

Virtualized environments continue to evolve organizational operations in profound ways designed to simplify management, improve quality of service (QoS), and enhance security. These environments also require increasingly sophisticated networking to keep pace with workload and I/O resource-sharing demands that collaboration applications, virtual desktop infrastructure, private clouds, and other systems require.

Having virtualized their servers, many organizations are now virtualizing their networks to expand dynamic resource management capabilities and enhance flexibility at the data center level. Organizations planning large-scale VMware vSphere 5.1 Enterprise Plus implementations running on Intel® Xeon® processor-based Dell™ PowerEdge™ 12th-generation servers with Intel Ethernet Converged Network Adapters (CNAs) can meet resource management objectives by using the VMware vSphere Distributed Switch (VDS) feature.

Prior versions of vSphere require administrators to configure a virtual network using multiple VMware vSphere Standard Switches (VSSs), or vSwitches, which may lead to human error. VSSs also require static allocation of bandwidth, which may impinge on flexibility and performance. The opportunity to configure a single VDS instead of multiple VSSs is an important advance that helps simplify implementation dramatically while enabling organizations to improve network flexibility, agility, and performance.

## Virtual network connectivity at the multihost level

Simple server consolidation using virtualization replaces individual, dedicated servers with virtual machines, many of which can reside together on a single physical host. A software-based virtual switch such as the VMware® VSS can route traffic among the virtual machines, acting analogously to the top-of-rack

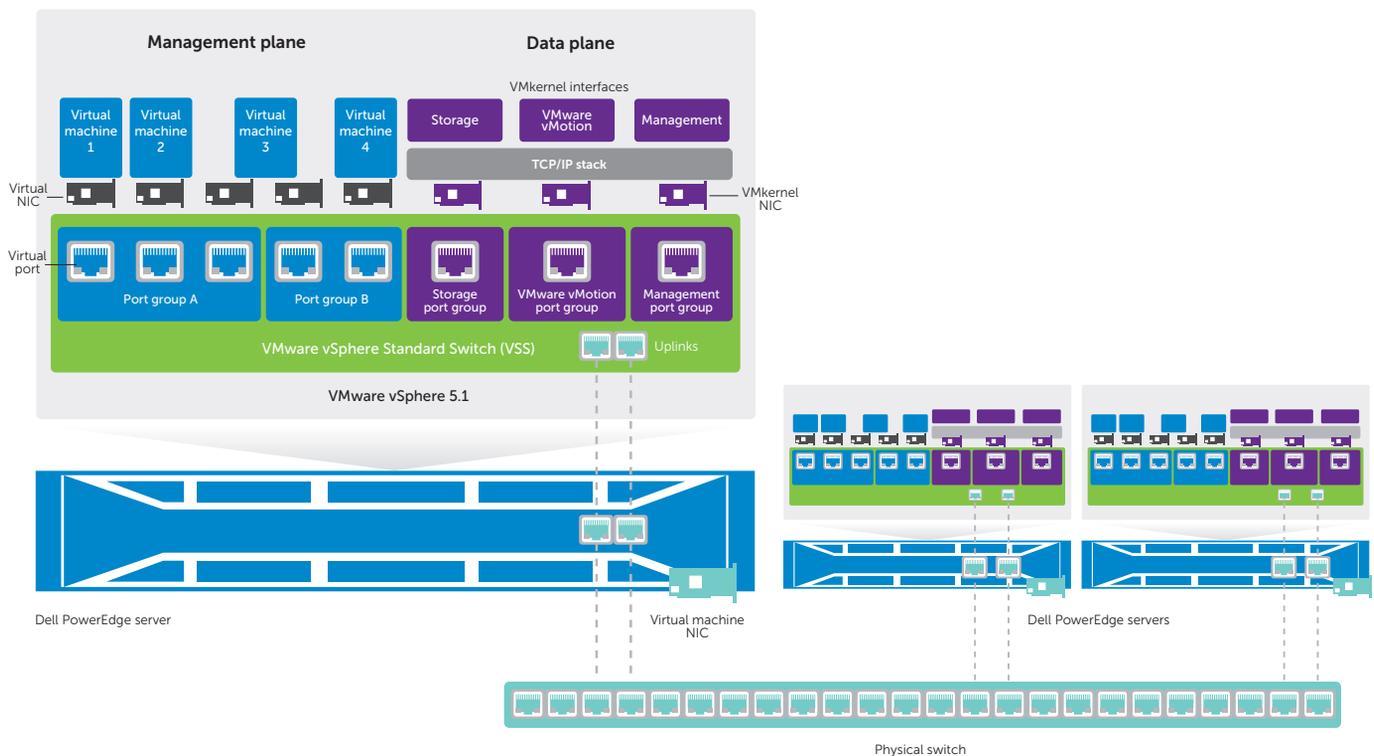


Figure 1. Virtual networking through VMware VSSs

switch in a nonvirtualized environment. The VSS allows the environment to dynamically assign network resources as needed for increased agility compared to physical components. However, the limitations of physical networking still constrain the communication between virtual machines on different hosts, because communication must pass through the core network and switch.

To address the limitations placed on virtual networks by physical segmentation between hosts, which characterizes the VSS model, VMware vSphere 5.1 Enterprise Plus provides advanced VMware VDS technology. VDS is designed to create a higher level of abstraction with virtual interconnections among virtual machines that span across hosts in contrast to the per-host model that VSS provides.

Because it operates as a single virtual switch across all associated hosts, the VDS functions as a network switch for both internal and external network connectivity. It handles network traffic at the multihost level, routes traffic internally between virtual machines, and links to an external network by connecting to physical

Ethernet network adapters. The VDS also allows virtual machines to maintain consistent network configuration as they migrate across multiple hosts in the vSphere environment.

### Heightened bandwidth per port

Today, in data centers that consolidate virtualized server deployments, network connections to physical hosts function as switch uplinks that carry traffic from a large number of virtual machines. Therefore, the network connections on physical hosts should use the same type of configurations that switch uplinks use—typically 10 Gigabit Ethernet (10GbE) connections. Enhancements and optimizations of the VMware VDS technology originally available in VMware vSphere 5.0 offer an open, big-pipe model in which each port uses 10GbE bandwidth.

vSphere 5.1 offers advanced capabilities for virtual networking that take advantage of the virtualization features built into Intel Ethernet CNAs. Version 5.1 can support up to eight physical 10GbE ports, which helps to take advantage of the processing headroom of servers such as Dell

### Dive deeper

Download the white paper "Simplified, high-performance 10GbE networks based on a single virtual distributed switch, managed by VMware vSphere 5.1" to learn more about deploying VMware and Intel technologies that together can optimize virtualized, large-scale networks.

[qrs.ly/v42y7ih](http://qrs.ly/v42y7ih)

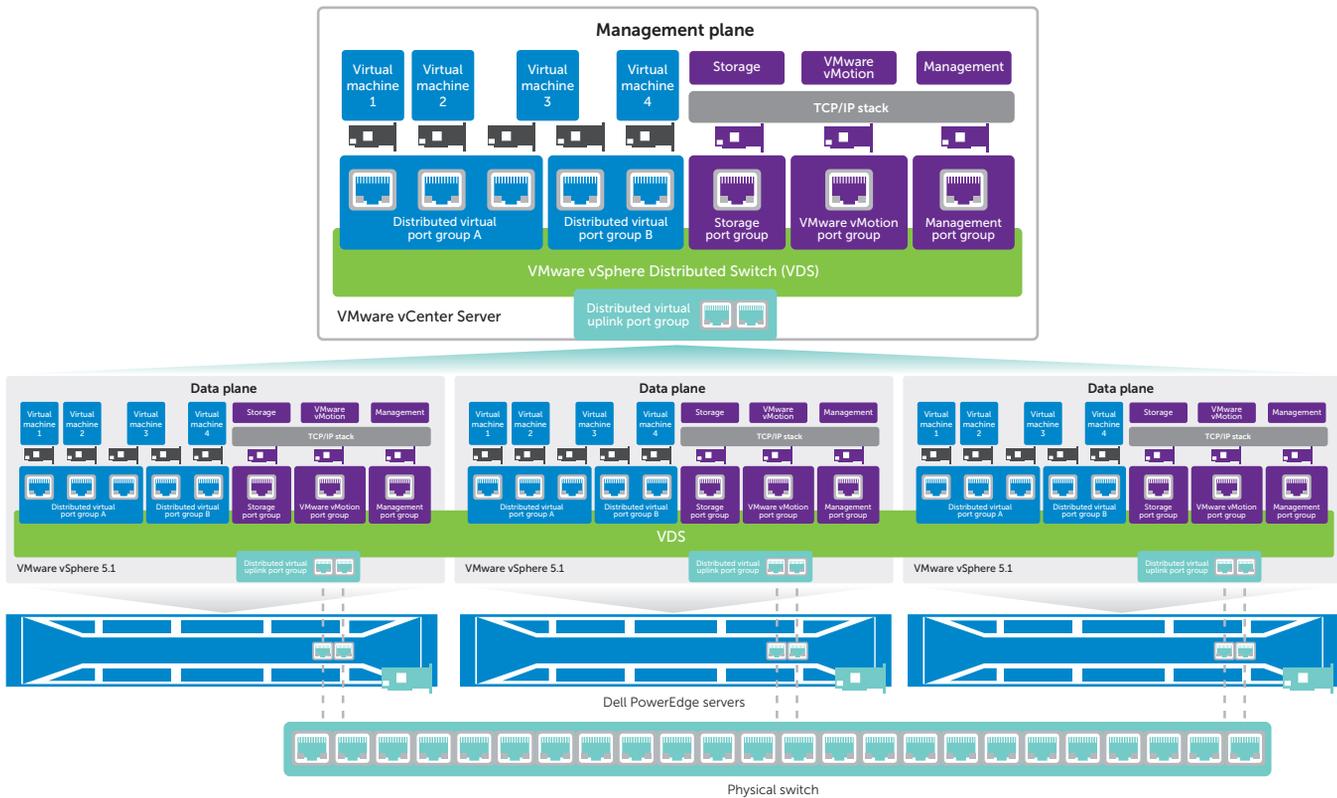


Figure 2. Virtual networking through a VMware VDS

PowerEdge 12th-generation servers based on the Intel Xeon processor E5-2600 product family. As a capability of vSphere, these ports can provide up to four Fibre Channel over Ethernet (FCoE) adapters, eight Internet SCSI (iSCSI) adapters, and four VMware vSphere vMotion® technology paths.

The VDS helps simplify the management of these types of large-scale resources. This combination of technologies enables enhanced flexibility from the virtual networking environment while maintaining high availability and QoS.

### Virtual distributed switching for elastic network management

Unlike VMware VSSs that allow administrators to manage resources only at the per-host level, using the VMware VDS feature enables IT organizations to treat the virtual network as a single aggregated resource. This resource can be centrally managed using the VMware vCenter™ Server virtualization management platform.

Many of the concepts associated with configuring VSSs also apply to configuring the VDS feature. For example, port groups in a VSS

specify port configuration for each member virtual port. The corresponding entity on a VDS is the distributed port group, which spans multiple hosts and defines how connections are made through the VDS to the network.

Using a VSS-based configuration, one or more port groups connect to virtual machines through a virtual network interface card (NIC) (see Figure 1). On the other side are virtual uplink connections to physical Ethernet server adapters that allow the virtual machines to connect to the physical environment. Virtual switch uplinks can connect to more than one physical Ethernet adapter to enable NIC teaming. NIC teaming means two or more physical adapters share the traffic load or failover capabilities if a physical adapter fails or a network outage occurs. VMkernel NICs connect services such as iSCSI or VMware vSphere vMotion to the physical network.

Each VSS port group is assigned a network label, which is specified when attaching a virtual NIC to a port group. All port groups in a data center that are able to pass data to one another are assigned the same network label, which



allows technologies such as vMotion or functions such as access to IP storage to occur within a port group, but not among multiple port groups. In this way, port labels enable interoperability while also enabling data isolation as required.

When deploying a VDS, both the virtual switch and distributed port groups—including distributed virtual port groups—span multiple physical hosts (see Figure 2). Distributed port groups aggregate multiple ports across physical hosts under a common configuration and provide a stable anchor point for virtual machines connecting to labeled networks. The VMware virtual switching layer provides a set of features similar to those in traditional physical switches, including virtual LANs (VLANs), traffic shaping, and monitoring.

The scope of traffic-shaping policies that can be configured in distributed port groups is a key area in which use of a VDS helps improve on the corresponding capabilities for port groups with the VSS. The VSS supports policies for outgoing virtual machine-to-network traffic shaping only. The VDS adds support for inbound network-to-virtual machine traffic shaping as well.

Configuration considerations also differ for the VDS feature. Network resource pools are used to configure the priority that different network traffic types are given on a VDS, by setting bandwidth parameters for physical adapters. Configuration settings such as traffic shaping, teaming, and load balancing, as well as port security, are configured through distributed port groups. This approach helps ensure configuration consistency for virtual machines and virtual ports necessary for live migration using vMotion.

### Virtualized I/O resource sharing

Another key requirement for expanded virtualization is the effective allocation and sharing of I/O resources (see the sidebar, "Controlling shared resource allocation"). Three primary sharing models have emerged: software-based sharing, hardware-assisted sharing, and hypervisor-bypass offload.

The software-based sharing model requires the processor to handle the network traffic routing and management, with the possible result of limiting virtual machine performance and scalability. In hardware-assisted sharing, VMware NetQueue—enabled by Virtual Machine Device Queues (VMDq), a component of Intel® Virtualization Technology for Connectivity (Intel VT-c)—helps reduce latency significantly and increase the throughput capability of a virtual switch. Hypervisor-bypass offload makes use of the PCI-SIG Single Root I/O Virtualization and Sharing (SR-IOV) specification supported in VMware vSphere 5.1 Enterprise Plus. This approach can greatly increase the usefulness of direct assignment by allowing multiple virtual machines to bypass the hypervisor using a single port (see Figure 3).

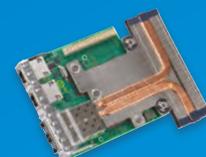
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# Controlling shared resource allocation

The VMware vSphere Distributed Switch (VDS) feature supports vSphere Network I/O Control (NetIOC). NetIOC provides for the use of limits and shares parameters to control the allocation of shared physical network resources that are in contention for bandwidth by multiple traffic types on the same network pipe. This powerful feature can make vSphere deployments particularly suitable for I/O-consolidated data centers. The following best practices help optimize the use of NetIOC:

- Utilize bandwidth shares instead of hard limits for bandwidth allocation, because the shares enable greater flexibility than the limits for unused capacity redistribution.

- Limit the bandwidth usage of specific resource pools to avoid jeopardizing performance for other flows going through the same points of contention.
- Set the corresponding resource-pool shares to the predefined default shares value for VMware Fault Tolerance, because fault tolerance is a latency-sensitive traffic flow.
- Use load-based teaming (LBT) as the VDS teaming policy while using NetIOC to maximize networking capacity utilization.
- Employ the VDS feature port groups as a means to apply configuration policies to different traffic flow types, and to provide additional bandwidth controls through the use of traffic shaping.

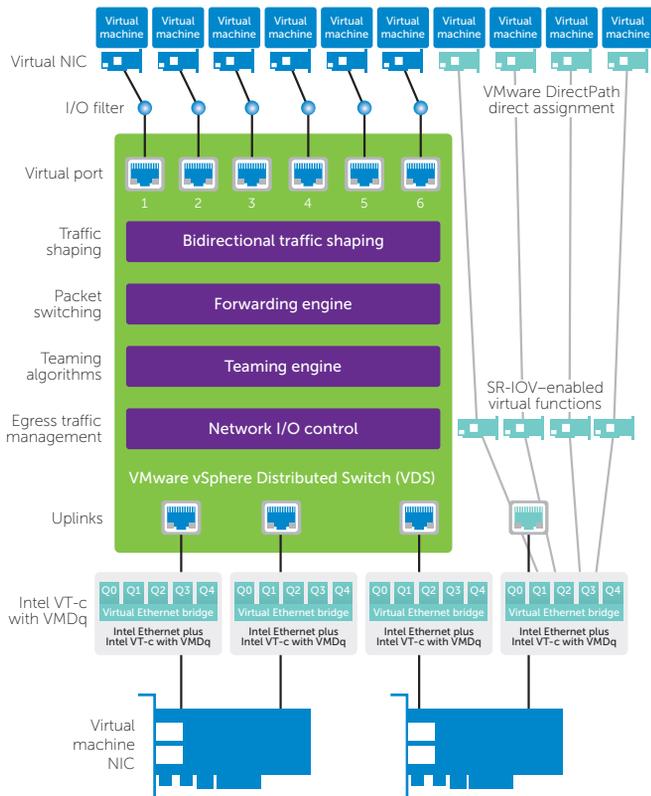


Figure 3. Virtual networking using Intel VT-c and VMDq, with VMware DirectPath I/O and SR-IOV for special-case workloads

VMware VDS can dynamically allocate resources with VMDq but not SR-IOV, it is the recommended default choice for network I/O resource sharing. At the same time, VMware DirectPath I/O with SR-IOV enables virtualization of workloads that could not otherwise be virtualized, which makes it a valuable special-case technology.

## Dynamic data center network management

Organizations adopting technologies and approaches to enhance networking performance, maximize server consolidation, and virtualize all workload types can utilize advanced VMware VDS capabilities in VMware vSphere 5.1 Enterprise Plus and related tools. The VDS enables network architects to dynamically allocate network resources and provide excellent support for enterprise requirements.

The VDS facilitates managing physical and virtual networking resources from a single VMware vCenter Server management console, and extends centralized management of virtualized resources using vCenter Server to include virtual machines on many physical hosts in a single pool. Dynamic, data center-level resource management executed in this manner represents a significant advance over per-host management and static bandwidth allocation between hosts. <sup>PS</sup>

## Author

Brian Johnson is a solution architect in the networking division at Intel for networking and virtualization technologies.

## Learn more

VMware and Intel technologies:  
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# Optimizing end-to-end application migration and modernization

By Scott Sawyer and Thomas Crowe

The time is ripe for organizations to migrate business-critical applications from legacy UNIX® and RISC-based systems to x86-compatible platforms. Dell and Red Hat offer modernization and open-standards innovations for efficient application migration.

Advanced, industry-standard systems address a broad range of infrastructure and application processing requirements in many of today's enterprises. Yet, many of these same organizations continue to rely on proprietary UNIX and RISC-based environments to support certain business-critical applications. And even though running essential applications on proprietary systems can be costly and require specialized expertise, organizations may be reluctant to migrate from the legacy systems that have supported the backbone of their operations for years.

Because legacy UNIX and RISC-based infrastructures represent a significant sunk investment for many enterprises, budget-constrained IT organizations may feel compelled to live with costs already incurred. Original hardware costs and years of accrued maintenance fees can be so large that displacing technology representing such a substantial presence in the organization can be difficult to envision. However, many organizations are now experiencing increasing pressures to upgrade IT systems to comply with regulations and to take advantage of emerging technologies such as cloud computing, virtualization, mobile devices, and big data. Modernizing application environments and eliminating

proprietary platforms by migrating to cost-effective systems can heighten efficiency and agility and enable organizations to embrace emerging technologies.

Dell and Red Hat have collaborated to help organizations simplify and streamline the migration of business-critical applications from UNIX and RISC-based systems to open, x86-based systems, such as Dell™ PowerEdge™ servers. By utilizing this approach, organizations can achieve low total cost of ownership (TCO) and gain a flexible IT infrastructure that scales with business growth.

## Best practices for application migration

Red Hat provides enterprise-class, open-standard environments that enable smooth application deployments. More than 2,000 vendors offer more than 10,000 software applications as part of the Red Hat® Enterprise Linux® independent software vendor (ISV) ecosystem. Dell provides comprehensive application modernization services that include extensive engineering of Linux-based solutions to streamline the migration process for IT organizations.

The Dell and Red Hat partnership also features an original equipment manufacturer (OEM) arrangement in which Dell provides organizations with a one-stop shop for hardware, software, and services. In addition, up to 99.9 percent of Red Hat Enterprise

Linux support problems that are reported to Dell Support are resolved in-house without escalation to Red Hat.<sup>1</sup>

Years of experience have led Dell Services' experts to develop and refine the following five best practices that help simplify seemingly complex modernization initiatives:

1. Assess existing applications and interfaces up front
2. Develop a comprehensive, accurate business case
3. Leverage migration expertise and proven methodologies
4. Work with an expert solution provider to address a range of applications without disrupting operations
5. Start with simple and/or high-return tasks to build migration momentum

By following these best practices, organizations can minimize disruption and reduce overall man-hours during a migration project, helping to ensure a successful outcome.

## Assess existing applications and interfaces up front

An IT portfolio may have a complex chain of dependencies, and many organizations lack full transparency into their applications and hardware assets. A solid migration plan should not only identify palpable and hidden

<sup>1</sup> Results based on 2012 internal Dell testing.



application-server dependencies, but it should also anticipate the impact on operations and software assurance processes.

Measuring and tracking communication among servers is integral when planning a migration. For example, an administrator shutting down a Lightweight Directory Access Protocol (LDAP) server that is providing authentication for several services may inadvertently render those services unavailable during a transition, potentially leading to problems and lost revenue.

Applications may also depend on middleware that runs on particular servers. IT organizations need to accurately document such dependencies to help them understand the order in which applications should be migrated. Otherwise, they run the risk of a miscalculation derailing the migration process. For example, if encryption and other security measures in place are not accounted for in the migration plan, there is no guarantee that such a service would immediately be restored when an application is redeployed to a new platform.

Organizations that have undergone mergers, acquisitions, or other significant changes offer another potential scenario. They have likely added an influx of new systems and applications to the mix, and may not have a clear picture of the current state. In this case, an internal assessment should be performed or an experienced third-party solution provider brought in before embarking on a migration and modernization initiative.

In its workshop, assessment, design, and implementation (WADI) methodology, Dell Services offers a migration strategy that comprises discovery, analysis, and execution. This model helps ensure no application or service is overlooked and provides experienced engineers a way to conduct migrations in a logical progression that minimizes downtime. Utilizing fit-for-purpose migration technology, Dell Services collects and analyzes information on source code assets, data structures, and functional

interdependencies. This comprehensive assessment process provides a clear understanding of how applications are used to achieve business objectives and how to conduct a migration project without disrupting operations.

#### **Develop a comprehensive, accurate business case**

Migration can be a complex undertaking that requires substantial resources, leadership focus, and interdepartmental cooperation. It can be successful only if there is sufficient support from upper-level management, which typically is obtained through a solid business case.

At the outset, an organization should explore whether the target architecture it envisions will provide the desired cost-effective benefits or if there may be other alternatives to consider. For example, some organizations may want to implement the smaller parts of a migration first. However, significant return on investment (ROI) can be acquired by shutting down high-cost, high-volume servers in a timely fashion. Delaying more expansive parts of a migration in favor of small increments may actually extend the operation of costly legacy servers, which can mitigate potential savings.

Dell Services is not only capable of executing large-scale migrations, but it can also provide business cases and cost-benefit analyses to help estimate ROI for particular scenarios. This assessment helps identify the migration priorities that may foster maximum ROI in a short amount of time. It also allows organizations to justify initial investments in hardware and services, which can be a key first step in obtaining buy-in and commitment for the engagement from organizational leadership.

#### **Leverage migration expertise and proven methodologies**

Many organizations may be fully utilizing all available assets to support the steady-state maintenance of existing applications and

hardware platforms. This situation leaves little time to plan and execute a platform migration. Some organizations may also lack the available resources and in-house skills necessary to accomplish migration and modernization in a timely fashion. In these cases, third-party service providers and ISVs can assist with the transition to new environments.

Many service providers and ISVs offer comprehensive sets of tools to assist IT organizations in the migration of applications from UNIX and RISC-based systems to x86-based servers. Dell provides a wide range of services that include the following offerings to guide IT organizations through the migration process:

1. Selecting and prioritizing the applications to be migrated
2. Determining new hardware requirements
3. Identifying and resolving problems through a pilot process
4. Migrating applications and data
5. Conducting testing and quality assurance
6. Performing production cutover
7. Providing training and knowledge transfer to existing operations and development teams in the new environment

Dell Services helps organizations implement an efficient and effective modernization plan that gives IT staff the flexibility to continue driving innovation and supporting day-to-day operations for their organizations.

#### **Work with an expert solution provider to address a range of applications**

Much of the ROI in a migration comes from shifting to new servers and shutting down the old ones, which helps reduce energy requirements, data center space consumption, and annual maintenance costs. Any migration that is delayed or incomplete can mitigate these cost benefits. Organizations should therefore avoid a strategy that completes only part of the job.

	Tier services	Third-party application examples	Complexity and effort level	Impact on migration effort
<b>Infrastructure</b>	File and network core services	Domain Name System (DNS), Dynamic Host Configuration Protocol (DHCP), LDAP, and IBM® WebSphere MQ	Low	Migration should be straightforward unless an organization deploys exotic, third-party applications.
<b>Presentation</b>	Web, cache, and proxy servers	Apache™ HTTP Server, IBM HTTP Server, and Oracle iPlanet Web Server	Low	Migration should be straightforward, although validation needs to occur with the application layer.
<b>Databases</b>	Information repositories	Oracle Database, MySQL, IBM DB2, and IBM Informix database software	Low	Migration should be straightforward; however, excessive use of stored procedures can increase the difficulty of the migration.
<b>Applications</b>	Engines or logic layers to modify data	IBM WebSphere; Oracle WebLogic; mainstream, third-party applications; and C/C++	Mid	Application size can make a difference in the migration effort.
<b>Packaged applications</b>	Large, complex, third-party applications	SAP Business Suite, Oracle PeopleSoft, Oracle E-Business Suite, and Oracle's Siebel Customer Relationship Management applications	Mid	Migration difficulty ranges from easy to hard depending on the amount of customization.

Figure 1. Migration complexity by workload

For example, a third-party vendor may have the expertise to successfully migrate an Oracle® database from a UNIX-based platform to a Linux-based platform, but it may not have the expertise to address front-end applications. Many organizations still rely on customized legacy code that may have been written in-house by developers who are no longer employed by the organization. A migration service provider should have the experience to handle homegrown, in-house assets that can be re-architected to an industry-standard platform.

The Dell Services team has experience and knowledge spanning a wide range of applications including Oracle Database, Oracle E-Business Suite, Oracle PeopleSoft, Oracle JD Edwards, Oracle WebLogic, SAP® Business Suite, JBoss Enterprise Middleware Suite, and other applications. Well-established application re-architecting and application rehosting practices further

broaden Dell expertise in migrating custom code and legacy mainframe applications.

#### Start with simple and/or high-return tasks to build migration momentum

To sustain upper-level management commitment for a migration endeavor, meeting short-term milestones or producing tangible savings results quickly is important. Through its years of experience, Dell helps organize a UNIX-to-Linux migration project into a series of progressive stages. By first selecting applications that can be easily transitioned to a Red Hat Enterprise Linux environment and/or selecting workloads that can provide rapid return, momentum and executive support for a transition can be maintained (see Figure 1). Structuring projects into a series of successive phases helps build and refine skills in situations where organizations want to dedicate some in-house resources to the migration process.

Dell Services can assist in assessing migration readiness. This assessment not only identifies which applications should be migrated first—along with identifying potential costs and cost savings—but also which applications should not be migrated based on cost, complexity, and/or other timing considerations. In addition to application modernization services, Dell can assist IT organizations with power and thermal evaluations and virtualization assessments along with infrastructure design, deployment, and implementation.

#### Cost-effective solutions for modernization

Application migration and modernization initiatives may seem daunting to an organization with entrenched UNIX and RISC-based assets. However, moving to open, industry-standard platforms can bring substantial benefits. Organizations looking to safely cross the chasm and take advantage of industry-standard x86-based Dell platforms running Red Hat Enterprise Linux can capitalize on comprehensive application migration expertise and services resulting from a deep Dell and Red Hat alliance. From this relationship, enterprises can implement open, cost-effective migration and modernization solutions that include a wide range of hardware, software, services, and support offerings to help optimize their IT environments. 

#### Authors

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**Thomas Crowe** is the senior architect for IT modernization within the Global Solutions and Strategy Office at Red Hat.

#### Learn more

**Application modernization:**  
dell.com/appmod

**The Dell and Red Hat alliance:**  
dell.com/redhat



## Extending always-connected capabilities with mobile device management

By Saranya Babu

Consumerization of workplace devices can heighten worker productivity, but also it raises the stakes for application and data security. Dell KACE™ K3000 Mobile Management Appliances offer an easy-to-use, cost-effective way to manage mobile devices.

**A**cross a wide range of industries, today's on-the-go workers increasingly prefer to use their own laptops, tablets, and smartphones. By leveraging the opportunity to support always-connected employees who have the freedom to bring their own devices into the workplace, organizations are enjoying elevated productivity, business agility, and efficiency as they integrate technology advances comfortably into individual work environments.

At the same time, IT departments must respond to significant management and security challenges posed by the proliferation of consumerized devices and applications in bring-your-own-device (BYOD) workplace environments. Because many personal computing devices were not built to be enterprise-ready, IT departments must find a way to securely manage and effectively control access to critical enterprise applications and data from these devices. To help achieve that goal, IT teams must extend systems

management capabilities by building out an infrastructure designed to manage mobile devices.

Apple iOS and Google Android mobile operating systems in particular have driven standardization of mobile device management (MDM) and mobile application management (MAM). These operating systems offer a defined set of controls around which management vendors can build an infrastructure for MDM and MAM. Originally, MDM focused on managing mobile devices and their attributes, such as installed applications, software, settings, end-user information, and security. In contrast, MAM focused on managing mobile applications and their attributes including settings, security, the device on which they are installed, and the end users who access them.

Over time, MDM and MAM have merged to offer similar functionality. As a result, a management infrastructure that supports mobility has become commoditized to the point that virtually every approach offers basic features for device and application management. Because vendors differentiate themselves through advanced features and usability, understanding these differences helps IT organizations evaluate options and select a mobile device and application management approach that is appropriate for their business needs (see Figure 1).

### Building out comprehensive mobile device management

The Dell KACE Family of Systems Management Appliances offers an easy-to-use and cost-effective approach for managing a mix of enterprise and personal devices on platforms running Microsoft® Windows®, Apple Mac OS X, Apple iOS, Ubuntu, Novell SUSE® Linux® Enterprise, and Google Android operating systems. Dell KACE K3000

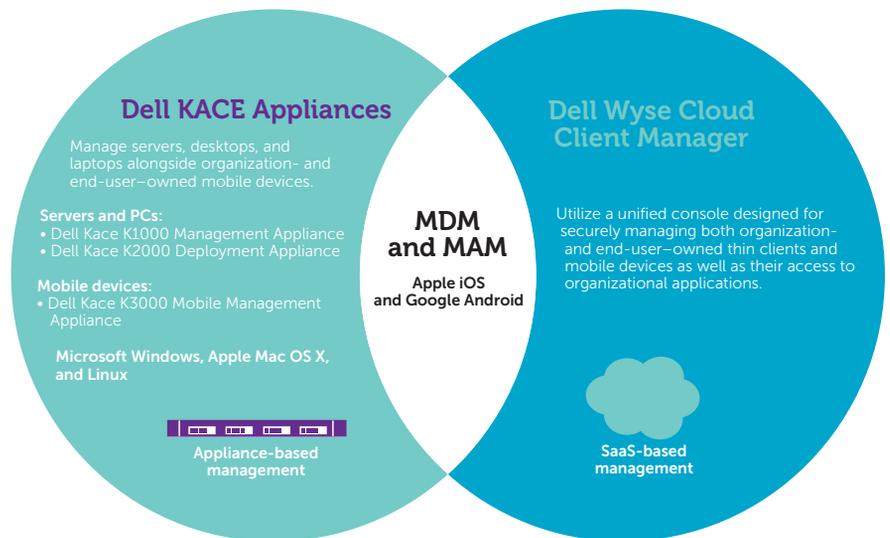


Figure 1. Implementing an end-to-end approach to managing mobile devices in organizational IT environments

Mobile Management Appliances help organizations build out efficient MDM through integrated systems management, customizable cloud- or on-premises-based deployment, and layered protection technology.

### Integrated systems management

Many approaches to MDM offer rich functionality. However, a siloed approach that uses separate point solutions for managing desktop systems, virtual machines, and mobile computing devices can create inefficiencies, degrade the end user's IT service experience, and hinder the application of security policies consistently across all IT assets.

An IT team that already manages desktops, laptops, servers, and virtual machines can benefit from using an integrated approach to managing these devices along with laptops, tablets, and smartphones across many platforms. Dell KACE K Series Appliances utilize an integrated approach, enabling IT administrators to manage these assets from a central location that enhances efficiency and helps reduce costs.

### Customizable cloud- or on-premises-based deployment

In general, organizational requirements determine the next step toward MDM—either a cloud computing-based, software-as-a-service (SaaS) deployment or an on-premises deployment. Selecting one option over the other often depends on the specific budget constraints of an organization, its preference for a cost structure based on capital expenses or operating expenses, security requirements, and the availability of IT staff with specialized training.

SaaS systems avoid installation requirements and are accessible from anywhere through cloud-based computing. However, they provide no visibility into the location of an organization's sensitive business data, which may pose a security risk. In addition, SaaS systems depend on network bandwidth for performance, and they often require a support call to the service provider for every problem that arises. For cloud-based deployments, the Dell portfolio of mobility solutions includes Dell Wyse™ Cloud Client Manager, a SaaS-based MDM approach.



An organization that has critical security requirements and an IT staff with specialized training may benefit from on-premises deployment of MDM. Installation and data storage are often controlled entirely in-house. On-premises deployment enables IT organizations to triage any issues that arise without having to make support calls to a service provider. And despite initial up-front costs coupled with ongoing support costs, on-premises MDM deployments are designed to be increasingly cost-effective over time. Dell KACE K Series Appliances, including the Dell KACE K3000 Mobile Management Appliance, are available as both physical and virtual appliances to offer organizations a variety of deployment options.

#### Layered protection technology

Securing enterprise content on personal devices in the workplace is particularly challenging because mobile devices pose an intrinsically higher risk of being lost or stolen than traditional desktop computers. Mobile devices also function outside the controllable confines of the organizational network. Although many security technologies are available to address this problem, none alone can ensure that enterprise content is completely safe. Several layers of security are typically required to build effective protection. In addition to network encryption, virtual private networks (VPNs), and firewalls, IT organizations can control access through virtualization or containerization.

Virtualization allows access to enterprise content through virtualized desktops and applications, offering a seamless experience across all devices and helping ensure that sensitive data is never stored locally on mobile devices. However, virtualization does not offer offline access, and the end-user experience can be limited by network bandwidth. Containerization creates a secure repository for enterprise content that resides on mobile devices, helping ensure that sensitive data is safe while offering offline access. When an employee leaves the organization, however, administrators must take positive action to remove local data from the device.

The Dell portfolio of mobility solutions helps IT teams protect enterprise content from unauthorized mobile devices and unsecured access points. By utilizing a multilayered approach to security, IT organizations can deploy a secure organizational container designed to protect valuable data not only on data center servers, but also on mobile devices in the field and at remote locations.

#### Managing mobile devices on premises

Dell KACE K3000 Mobile Management Appliances deliver an on-premises approach to leading-edge systems management technology for managing BYOD environments. This robust approach to integration, deployment, and security helps IT organizations integrate management of PCs, servers, mobile devices, and other end-user devices while helping simplify complex and repetitive systems management tasks.

With support for Apple iOS and Google Android platforms, Dell KACE K3000 Mobile Management Appliances provide both MDM and MAM capabilities. Integrating these offerings with Dell KACE K1000 Systems Management Appliances, which support Microsoft Windows, Apple Mac OS X, and Linux operating systems, enables IT organizations to accurately and efficiently track, monitor, and manage servers and desktops together with diverse mobile devices.

To help enterprises fully realize the potential benefits of BYOD workplace environments, Dell enables IT organizations to extend their systems management capabilities and embrace mobile devices. Dell KACE K3000 Mobile Management Appliances offer a simple and cost-effective way to help IT organizations protect mission-critical applications and data—helping to avert security risks from a deluge of consumerized mobile devices and applications flooding into today's enterprise workplace. 

#### Learn more

**Dell KACE K3000 Mobile Management Appliance:**  
[kace.com/products/mobile-management-appliance](http://kace.com/products/mobile-management-appliance)

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[kace.com/products/overview](http://kace.com/products/overview)

**Safe and secure BYOD:**  
[qrs.ly/732yony](http://qrs.ly/732yony)

#### Author

**Saranya Babu** is the senior product marketing manager for the Dell KACE K1000 Management Appliance and the Dell KACE K3000 Mobile Management Appliance.



# Enhancing business operations through secure networks

Internet-connected organizations have industry-specific needs for network security that are driven by law, customers, and the IT environment. Dell™ SonicWALL™ products help organizations of all sizes manage and protect remote and local networks.

**V**irtualization, cloud computing, and mobile technologies have changed the way organizations conduct business, providing real-time information, interactive collaboration, rich media, and much more.

At the same time, security threats have emerged to exploit the opportunities presented by these technologies, and rising network traffic taxes the bandwidth requirements for mission-critical applications. In addition, organizations across many industries are subject to regulations designed to ensure the security and privacy of data and resources.

The success stories featured here demonstrate how organizations have deployed Dell SonicWALL solutions to help protect their networks from both internal and external attacks and application vulnerabilities while facilitating remote access and regulatory compliance. SonicWALL products include hardware, software, and virtual appliance-based security solutions that are part of the Dell Software portfolio.

Whether they are serving meals, supporting physicians, protecting public safety, processing hazardous waste, or researching diseases, these organizations are able to reduce risk and complexity by integrating automated dynamic security capabilities within their IT infrastructures.

## Lettuce Entertain You Enterprises

# 99.9%

Using Dell SonicWALL firewalls, the restaurant group boosted its availability, experiencing an uptime of 99.9 percent.

## Altru Health System

# 5,000

A single Dell SonicWALL Aventail E-Class Secure Remote Access (SRA) appliance enabled concurrent access for up to 5,000 of Altru's remote and mobile staff.

## Mississippi Department of Corrections

# 100%

The department saw a 100 percent reduction in attack penetration after deploying a Dell SonicWALL Network Security Appliance (NSA).

## PSC

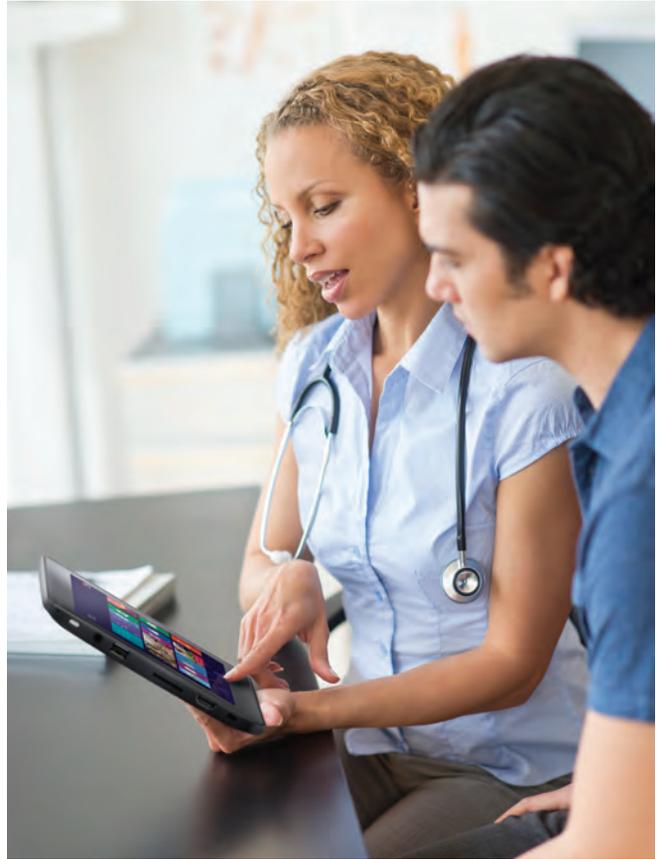
# 16x

Using Dell SonicWALL Next-Generation Firewalls, the waste management company experienced up to 16 times increase in bandwidth.

## University of South Florida

# 2/3

The Dell SonicWALL Email Security Appliance (ESA) Series enabled the university's pediatric epidemiology center to cut spam by two-thirds.



➔ **Lettuce Entertain You Enterprises:  
Cultivating business efficiencies**

Established in 1971, Lettuce Entertain You Enterprises, Inc., operates approximately 85 restaurants across the United States, including R.J. Grunt's in Chicago and the Eiffel Tower Restaurant in Las Vegas. To support its business, the company required a network that enhanced connectivity for employees, protected credit card transactions, and delivered high availability for processing customer loyalty and gift card transactions.

The company deployed Dell SonicWALL network security appliances to achieve a centrally managed virtual private network (VPN) infrastructure that helps protect credit card transactions and facilitates adherence to Payment Card Industry (PCI) standards.

"Dell SonicWALL segments the network, so a guest wireless user in a restaurant cannot access financial traffic, and our events staff can give a third-party client portal access without affecting our PCI compliance," says Steve Alessia, system engineer at Lettuce Entertain You. "Network security is much easier to manage and less vulnerable than our previous solution."

The SonicWALL appliances also deliver load-balancing and high-availability capabilities that enhance performance. "Our uptime has increased to 99.9 percent," says Alessia. "Dell SonicWALL has done wonders for us to speed up performance."

➔ **Altru Health System:  
Enhancing records access**

Altru Health System is a community-owned, integrated health-care system serving over 200,000 residents at 20 locations in North Dakota and Minnesota. To manage its electronic medical records (EMR), Altru migrated to an upgraded Epic EMR application. "The movement to EMR drives a need for us to provide access to this information from many different places," says Matt Schumacher, manager of technical support at Altru. "And we need to do it securely."

Altru required the bandwidth and the infrastructure to support many different types of information while complying with Health Insurance Portability and Accountability Act (HIPAA) mandates.

To help secure both remote access and local traffic, Altru deployed Dell SonicWALL E-Class firewalls and Dell SonicWALL Aventail E-Class Secure Remote Access (SRA) appliances. "What ultimately makes us more successful is the ability for us to connect to all the remote branches or home users and get them connected securely," says Eric Hoffner, technical analyst at Altru. "Dell SonicWALL gives us more options, more features, and the flexibility to simplify management by consolidating different types of remote access products into one platform."



### ➔ Mississippi Department of Corrections: Locking down threats

The Mississippi Department of Corrections (MDOC) provides and promotes public safety through efficient and effective custody, care, control, and treatment of offenders. Its network has approximately 1,600 users who depend on access to the department’s mission-critical application resources.

MDOC saw an increase in application-based attacks that its existing firewall was unable to counter—making it difficult to maintain compliance with state regulations. Also, the department needed secure access to internal resources for remote and mobile staff and officers.

By deploying a Dell SonicWALL E-Class Network Security Appliance (NSA) E5500 firewall and a Dell SonicWALL Aventail E-Class Secure Remote Access (SRA) appliance, the department was able to gain the application visibility and control required to maintain compliance. “The NSA E5500 gives us complete insight into the traffic. It gives us the ability to go in and monitor the application layer,” says Jerry Horton, MDOC network systems manager. “We have seen a 100 percent reduction in attack penetration, and we have eliminated BitTorrent traffic.”

Moreover, secure remote access helps boost staff productivity and reduce costs. Remote and mobile users can access resources from anywhere, and IT fields fewer support calls.

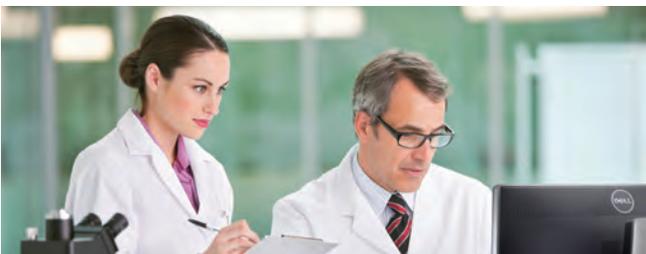


### ➔ PSC: Cleaning up on bandwidth and reliability boosts

Based in Houston, Texas, PSC is a waste management company that processes hazardous environmental waste and provides industrial cleaning and maintenance services. Previously, PSC relied on individual T1 connections to its distributed locations over a Multiple Protocol Label Switching (MPLS) network, but the company experienced unacceptable downtime.

To enhance network bandwidth and reliability, PSC deployed more than 90 Dell SonicWALL Network Security Appliance (NSA) and TZ Series firewalls across its enterprise network. The firewalls have helped increase bandwidth availability. “We increased the amount of bandwidth almost everywhere, with bandwidth increases in many locations from double to 16 times,” says Jim Burns, CIO at PSC.

PSC also experienced heightened reliability. “The virtual private network (VPN) connections are rock solid,” says Burns. “We improved quality and reliability because of Dell SonicWALL’s ability to detect that the primary is down and roll it over to the secondary in under eight seconds.” Burns adds, “We were spending US\$1.2 million and Dell SonicWALL let us cut that in half so that we are saving US\$600,000 a year. We took some of the savings and rolled those into secondary connections and other projects.”



### ➔ University of South Florida: Securing big data

The University of South Florida Pediatric Epidemiology Center comprises a diverse team of biomedical, health, and computer science experts. The center facilitates knowledge exchange between physicians and patients throughout the world.

For Joe Gomes, the center’s director of systems and technology, the challenge is in keeping the network secure and protected against malware. “We do not want anyone to have

access to sensitive clinical data except the researchers who will actually be working on it,” says Gomes.

As the center analyzed growing volumes of big data, it needed to upgrade the processing capacity of its firewall to secure the corresponding increase in network traffic. The center deployed Dell SonicWALL SuperMassive Next-Generation Firewalls to help securely and efficiently transfer the big data. “Our performance has increased tenfold,” says Pablo Ruiz, the center’s IT manager.

Spam had been another major issue for the center, which receives up to 20,000 e-mails a day on average. By replacing its previous e-mail security device with a SonicWALL Email Security appliance, the center is able to cut about two-thirds of the spam it used to receive. **PS**

[Learn more](#)

Dell SonicWALL:  
sonicwall.com



## Koehler Paper Group

# A ticket to efficiency

Through deploying an innovative Dell–SAP database infrastructure, Koehler Paper Group cuts its business warehouse costs while boosting staff productivity.

**G**ermany-based Koehler Paper Group, a world leader in specialist paper manufacturing, sells 500,000 tons of paper each year. It employs around 1,800 staff and reports an annual turnover of more than €700 million. Karl Schindler, head of IT at Koehler, says, “We use state-of-the-art technology to produce a range of technical and graphic paper types. But we also depend on technology to ensure that our business runs as efficiently as possible. We need it to be quick and easy for our employees to access and analyze data on everything from order processing to plant machinery downtime.”

Because efficient enterprise resource planning (ERP) is central to the company’s success, Koehler decided to implement a cutting-edge database infrastructure with existing technology providers Dell and SAP. Dell handled hardware setup and SAP conducted a sizing assessment. Both companies advised Koehler’s in-house team how best to complete the database migration. The entire implementation took only three days.

Koehler replaced its relational database setup with two Dell™ PowerEdge™ R910 servers with Intel® Xeon® processors running an SAP® HANA™ in-memory database. Schindler says, “We were already using SAP NetWeaver® Business Warehouse (BW) Accelerator, which delivered fast query and search response times, but SAP HANA on the Dell servers has taken things even further. It takes just 5 seconds to activate data with SAP HANA. With BW Accelerator, it used to take 330 seconds with the conventional database. And data modeling and design is at least 30 percent quicker, too.

“Users get the results they need in seconds, which means they can stay focused on the task at hand instead of having to come back to it once a report has been generated. Giving staff faster access to data on inventory management, sales, technical performance, and financial accounting has had a real impact on day-to-day productivity.”

### Reporting made easy

The Dell–SAP infrastructure has dramatically simplified reporting and analysis. Schindler says, “The new reporting infrastructure helps our employees make



better-informed decisions faster. Procurement data with millions of data sets can now be analyzed and broken down into single reports.”

Because of its ease of use, the Dell–SAP system enables employees to create reports without involving the IT team. “Now, users can search for and cross-reference any type of data—whether it involves sales, inventory management, financial accounting, or research and development—without IT staff having to spend time determining input criteria up front,” says Schindler.

And thanks to efficient processes, IT staff has freed up time to work on high-value tasks. Schindler says, “We’ve improved efficiency across the organization. Where SAP BW Accelerator helped us to create reports more quickly, SAP HANA optimizes the entire dataflow,



## Paging innovation

Manufacturing company Koehler Paper Group wanted to replace its conventional database environment with a more efficient infrastructure. The company worked with Dell and SAP to introduce a cutting-edge database solution in just three days.

**5 seconds**

The SAP HANA system enabled Koehler to cut data activation times from five minutes to five seconds.

**1/3**

Dell PowerEdge servers running SAP HANA helped Koehler lower the total cost of ownership for its business warehouse system by at least one-third.

**30%**

Since deploying the Dell-SAP infrastructure, the company has seen a 30 percent reduction in time required for data modeling and design.

from producer to actual user. These efficiencies have reduced the burden on the IT team. The introduction of SAP HANA on the Dell PowerEdge servers has seen us reduce the total cost of ownership of our business warehouse system by at least one-third.”

### Paving the way

Using its advanced database system, Koehler can gain enhanced insight into the business and a clear view of day-to-day activities. Schindler says, “The Dell-SAP environment is future-oriented. Not only does it help us use data in more innovative ways than our original setup, but it also puts us at the forefront of our field.

“Soon, it will help us accelerate complicated tasks such as processing and analyzing bulk data from our plant equipment in our process management system—something that’s practically impossible with conventional technology. We’ll be able to boost efficiency even further by preventing standstill times of plant equipment and planning maintenance more effectively.”

To help keep the system running, Koehler adopted SAP Enterprise Support, as well as Dell ProSupport with Mission Critical, which offers 24/7 support and on-site assistance within four hours. “In a successful project a few years ago, Dell implemented a virtualized infrastructure for our SAP ERP

system, which has been running 24/7 with no downtime ever since,” says Schindler. “I know from experience that if we come up against any issues, Dell will fix them straight away. I’ve never had any negative feedback about Dell support—I’d be the first to hear about it if my people had something to complain about.

“What I really like about Dell is its direct contact, personal advice, and end-to-end services. Most other suppliers have an intermediary company to deal with medium-sized companies such as us. But with Dell, we feel like we’re in a real partnership, and we get a certain continuity of service that other companies simply don’t provide.” **PS**



## Menzies Aviation

# Virtual payload

Menzies Aviation boosts business agility and streamlines the integration of new employees into its corporate network—thanks to a virtualized infrastructure based on Dell™ hardware running the Microsoft® Windows Server® 2012 OS.



**M**enzies Aviation provides passenger, ramp, ground-handling, and cargo-handling services to airlines worldwide.

A fast-growing company, Menzies Aviation operates at 136 airports in 32 countries, bringing in annual revenue of more than US\$1.1 billion and employing around 18,000 people. Best-in-class safety and security, as well as great customer service, are central to its success.

Because even minor service disruptions can have a detrimental effect on passengers and on cargo transport, Menzies Aviation constantly looks for ways to boost efficiency and keep operations running smoothly. Increasingly, the company sees IT as the catalyst in achieving these business goals and invests heavily in developing its infrastructure.

"IT is transforming businesses worldwide, and it's no different at Menzies Aviation," says Martin Gallington, senior vice president of IT at Menzies Aviation. "We work more closely with personnel than ever before, and the company looks to us for solutions for continued growth and development."

The company wanted to make it easy to integrate acquired businesses into the corporate network and give new employees access to Menzies Aviation applications. With the need to comply with strict aviation

and government regulations on data access, the IT team couldn't simply streamline the existing integration process because of the security risks. Much of the information held is highly confidential and must be protected for the safety of passengers and crews.

### Heightening agility with virtual domain services

With the assistance of Dell, Menzies Aviation joined the Microsoft Windows Server 2012 Rapid Deployment Program (RDP), which is designed to obtain feedback on software before its release to market while helping companies prepare for future migrations. Menzies Aviation worked with a Microsoft strategist from Dell to virtualize its Microsoft Active Directory® system with Windows Server 2012 and help simplify the identity management system. "We completed research and development for our Windows Server 2012 RDP 50 percent quicker with Dell, because it had direct access to Microsoft," says Justin Apps, head of enterprise architecture at Menzies Aviation. "In fact, our Microsoft strategist from Dell really made it a success."

As a result of the RDP, Menzies Aviation proved that it could accommodate rapid growth using Dell hardware and Windows Server 2012. Apps and Dell created a lab environment featuring a Dell PowerEdge™ R720 server running a virtualized instance of Active Directory Domain Services in Windows Server 2012. They took a snapshot of the company's production data, moved it to the lab environment, and ran it against the virtual domain services software.

Apps also saw that access across the business worldwide could be centrally managed, which helps avoid security breaches as the company added personnel and computers to the network. "Using Dell 12th-generation servers running Windows Server 2012, we could successfully virtualize

our domain services—making it easier to integrate new personnel and improve our business flexibility," says Apps.

### Driving growth through IT

Menzies Aviation can now grow without a corresponding expansion in its IT infrastructure, because the Dell PowerEdge servers, combined with Windows Server 2012 with Microsoft Hyper-V® virtualization, enable extremely high virtual machine density. "The density of the Dell PowerEdge servers will have a direct impact on the future of our company," says Apps. "We'll be able to roll out Windows Server 2012 and Hyper-V, maximizing the

content through the wide area network. Plus, advancements in Active Directory services make it easy for IT administrators to lock down employee mobile devices. Gallington says, "We can develop our mobile working strategy with the support of Dell solutions and Windows Server 2012. It will enable personnel to work effectively from more locations and ultimately deliver greater services."

After the success of RDP, Menzies Aviation began a refresh program for its active-active data centers. "We saw that the best way to support the business was to continue our relationship with Dell," says Gallington. Menzies Aviation ordered

**"Using Dell 12th-generation servers running Windows Server 2012, we could successfully virtualize our domain services—making it easier to integrate new personnel and improve our business flexibility."**

—Justin Apps

Head of enterprise architecture at Menzies Aviation  
November 2012

virtualization capabilities. The firm's IT now has the agility to deliver new services in line with demand. At the same time, the physical footprint of the data center won't increase, keeping down costs." Apps also liked that the PowerEdge 12th-generation servers could run at higher temperatures than previous generations.

Using Windows Server 2012 running on a Dell platform, the business can push the development of mobile and remote working. Because of the enhanced software code in the Microsoft system, staff members operating remotely have excellent access to rich graphics and 3D

Dell PowerEdge R620, PowerEdge R720, and PowerEdge R820 servers, as well as Dell EqualLogic™ PS6100 storage arrays. The company also plans to deploy Dell PowerVault™ MD storage arrays, Dell PowerVault TL tape libraries, and Dell PowerConnect™ 7048 switches.

"IT can help drive business growth at Menzies Aviation with the refresh of our data centers using Dell 12th-generation servers," says Apps. "They will provide greater density and virtual server capacity, so that the business can expand and we can deliver more services without increasing our data-center footprint." **PS**



# The second wave of big data: Shifting from services to solutions

By Evan Quinn

Think of 2013 as a year of transition, as IT decision makers consider the trade-offs of moving from services-led engagements toward appliances and preconfigured hardware that are designed to simplify the implementation of big data solutions.

For many big data buyers, 2012 was the year of services-led engagements. Suppliers with well-tuned professional and educational services units, such as Dell, IBM, and Opera Solutions, helped many early adopters achieve results. Apache™ Hadoop™ distribution providers, including Cloudera, Hortonworks, and MapR, also took part. But as organizational profiles shift from early adopters to early majority, discretionary budgets for big data are expected to be slimmer on average, and the number of highly customized, risk-taking projects may diminish.

Most true believers in data science have already made some kind of big data investment; in fact, they needed little convincing. However, the second wave of big data buyers wants an approach that is not primarily customized and is easy to implement. They look for all-encompassing solutions—infrastructures, platforms, productivity tools, and even big data applications—with lower apparent

costs than are typically incurred from mainly custom efforts.

Counter to much of the hype surrounding big data, Enterprise Strategy Group (ESG) has fresh evidence to support the notion that although big data investments during 2013 will be healthy, they will not be over the top: business intelligence (BI)/analytics spending, while above average for IT initiatives, sits in the third tier of initiatives in ESG's 2013 IT spending intentions research survey.<sup>1</sup> When asked "Which of the following business initiatives do you believe will have the greatest impact on your organization's technology spending decisions over the next 12 months?" 44 percent of respondents to the question cited cost-reduction initiatives. Security and business process improvement each came in at 31 percent; multiple selections were allowed. BI/analytics initiatives fell into a group in the 21–25 percent range, which included compliance, mobile computing, and collaboration.



<sup>1</sup> "Research report: 2013 IT spending intentions survey," by Bill Lundell and John McKnight with Jennifer Gahm, Enterprise Strategy Group, January 2013, [qrs.ly/ah2z6ao](http://qrs.ly/ah2z6ao).



## What are the most significant data processing and analytics challenges your organization faces with its largest data set?

(Percent of respondents, N = 399, multiple responses accepted)<sup>3</sup>

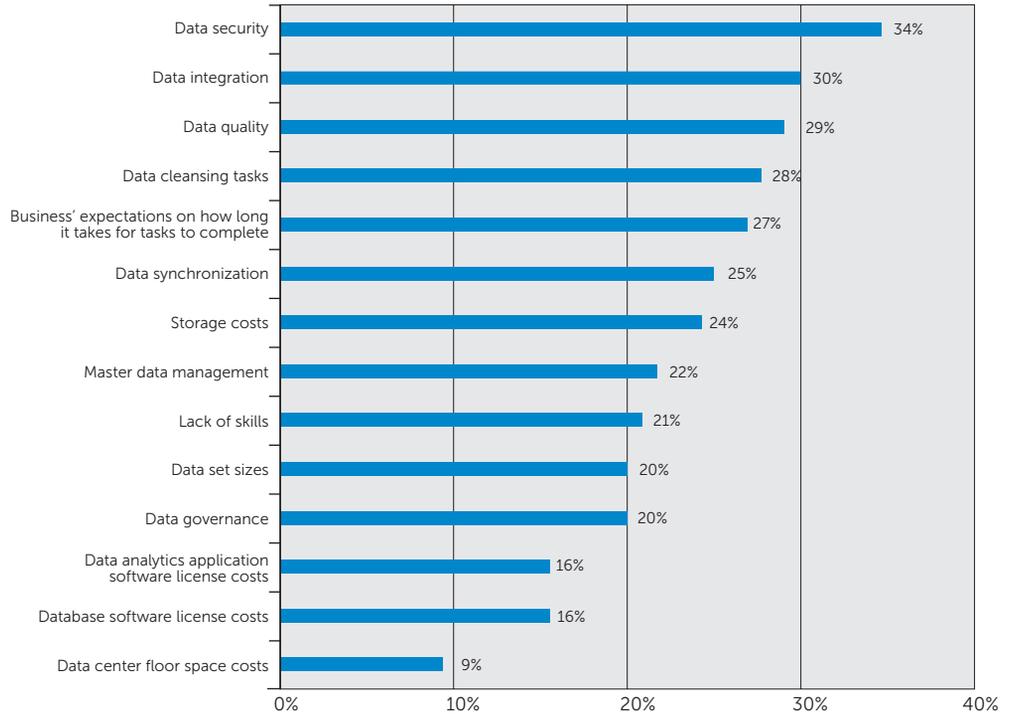


Figure 1. Data processing and analytics challenges

In fact, ESG saw the coming of the second wave in the latter half of 2012; Figure 1 is taken from a survey ESG conducted regarding big data.<sup>2</sup> The primary concerns include security, integrating data, cleansing data, and ensuring analytics performance does not disappoint users. To ESG, these primary concerns clearly reflected an enterprise-class set of needs. The notion of an experimental, throw-money-at-the-problem big data approach was already losing its luster.

### Recognizing the appeal of appliances and preconfigured hardware

Given healthy, albeit not extravagant, budgets for big data and buyers who are not quite at the cutting edge, where will big data buyers invest? ESG believes many of these buyers will increasingly show interest in appliances and preconfigured hardware for big data solutions. Though interest

continues to grow for using the cloud for parts of big data, many organizations still prefer to opt for infrastructure where they exercise control—but not to the point where they want to spin up their own clusters. And unless the organization is a Web 2.0–style company, ESG does not generally recommend a do-it-yourself (DIY) approach to spinning up and managing big data hardware and infrastructure for two main reasons.

First, few IT shops and almost no lines of business possess the big data expertise on staff to architect, design, spin up, and manage their own infrastructure for a full-scale and rapidly growing production environment. Those that take that risk without the requisite skills may quickly head over the edge of their own economic and delivery cliff. Those willing to hire DIY big data skills should expect to pay well more than average for relevant IT and data-science expertise.

<sup>2,3</sup> Research report: "The convergence of big data processing and integrated infrastructure," by Evan Quinn and Bill Lundell with Brian Babineau, Enterprise Strategy Group, July 2012, [qrs.ly/tp2z6as](http://qrs.ly/tp2z6as).



Second, organizations are overly optimistic if they believe chief marketing officers and lines of business will chip in massive amounts of budget for capital or operational expenditures that go toward big data projects with an unpredictable return on investment (ROI). The business may provide somewhat of an investment, but the serious projects—not the experimental ones—still answer to the chief financial officer (CFO), just like any other IT-oriented project, regardless of budgetary source. ESG believes, therefore, that serious projects should, if they plan to be successful, allocate a healthy, predictable, and dependable portion of budget for infrastructure. Appliances and preconfigured infrastructure fit those criteria.

The trick in these cases is to offer an appliance or preconfigured hardware tuned for a particular big data software solution. To date, ESG has not seen a successful generalized big data infrastructure with universal appeal, and does not expect one to appear in 2013 or probably ever. Instead, from a success perspective, when applicable it's important to have big data software solution and infrastructure providers walking hand in hand to help their customers with big data projects. That second wave of big data buyers wants the help and assurance from all the primary vendors involved, whether hardware, software, network, or hybrid—and they will still likely need plenty of big data services to help get going.

Dell has recognized the appeal of appliances, preconfigured infrastructure, and partnerships for big data. For example, the company currently offers a preconfigured Hadoop infrastructure that includes the Cloudera's Distribution including Apache Hadoop (CDH) software. Another example is the SAP® HANA™ appliance from Dell that is configured and highly tuned for HANA, an analytics database being used by an increasing number of SAP organizations

to revolutionize operational analytics. Dell also brings a set of well-versed SAP solution experts to the table and has even created a set of services specific to harnessing and managing the in-memory-powered speed of HANA.

### Meeting enterprises where they are

The year 2012 also saw an immense amount of investment from venture capitalists in early-stage big data solution providers. Unfortunately, 2013 begins the days of reckoning for some of those investments. ESG, therefore, really likes either the established, larger, and well-known solution providers that work well with others in the complex big data solution space, or those relatively new solution providers that specialize in a clear niche. And the smart solution providers from the latter category understand they need to work with trusted providers like Dell to reach interested but careful big data customers.

Dell formed partnerships with several big data solution specialists during 2012, such as Datameer, ParAccel, and Pentaho. These vendors offer holistic BI/analytics solutions that span core BI/analytics with a good dose of big data for medium-to-large companies, as offered by Pentaho, to the blazing-fast massively parallel processing (MPP) analytics database and platform for complex, predictive analytics from ParAccel. ESG believes Dell's span of big data solutions can help customers regardless of their current affinity for or expertise in big data.

### Defining big data going forward

To capitalize on big data, an organization's infrastructure requirements depend on its goals and current level of adoption. Has the company invested long-term in advanced analytics to better understand customers or to help make fresh discoveries that drive research and development? Or is the organization still struggling with

providing basic BI to its executives? Many companies are in between. But in nearly all cases, to make progress they must adapt their infrastructure to the needs of big data solutions and augment their expertise to some degree.

Much has been written about the three Vs of big data—referring to the fact that big data often involves more data, or *volume*; more types of data, or *variety*; and a faster influx of data, or *velocity*, than in the past. ESG believes that organizations should focus on six rather than three Vs, adding *veracity*, to help ensure analysts are working with clean data; *visualization*, to provide end users with rich, flexible, graphical tools to tap into the power of big data; and *value*, to help the CFO ensure that the organization realizes more benefit from big data than the investment being made in big data.

In 2013, the idea of *let's put up a few clusters, download Hadoop, throw some data at the clusters and MapReduce, and see what we can find* is not going to cut it. This approach no longer defines big data this year or going forward. Rather, organizations are demanding well-thought-out and proven infrastructures; software solutions that enable quick results; and services that help define realistic projects and results and deliver the combined big data solution—at a price that does not break the bank. **PS**

### Author

**Evan Quinn** is senior principal analyst at Enterprise Strategy Group.

### Learn more

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